Private Equity Investment in China

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Declaration for SOAS PhD thesis

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This thesis is dedicated to my parents

for their love, encouragement and endless support

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Abstract

This thesis investigates the impact of Private Equity (PE) investment on Chinese portfolio firms. The sample used in this thesis contains all non-financial PE-backed listed firms in mainland stock markets from 2000 to 2011. Three empirical chapters are included. First, we investigate the factors that motivate firms to receive PE investment in China. We find financing and signaling as motivation for PE investment in China are not accepted. Instead, firms with a largest shareholder or a concentrated ownership have higher motivation in receiving PE investment, which is consistent with the minority shareholder role of most PE investors. Second, we examine how PE investment affects Chinese portfolio firms. From regression model results, we confirm that the inflow of PE investment leads to better post-investment performance in the short run but PE investors' have less incentive in evolving into corporate government because their roles as minority shareholders. PE investment shows no significant impact on profitability in the long run. The evidence suggests that most PE investors are short-term-profit driven and their roles are mostly related to the help with IPO listing. Third, we examine which aspect of PE investment can explain IPO underpricing. We find that PE-backed IPOs tend to set higher offering prices (hence lower underpricing) than non-PE backed IPOs, which provides PE investors with higher exit profits via IPO. We finally attribute the lower underpricing to the speculation behaviour of PE investors in Chinese stock markets. This thesis applies the standard theories to a transition economy such as China, and contributes to the general PE literature by adding in the updated Chinese evidence.

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Chapter 1 Introduction

1.1 Motivation

Being the world's fastest-growing economy over the past 30 years, China has now become the world's second largest economy with an average GDP growth rate over 7%. Thanks to the leadership of Deng Xiaoping, the political and socioeconomic aspects of the capitalist economic system were introduced to the socialist market economy and China began to make major reforms since 1978. The Chinese economy is interesting and important because of its successful pattern which is different from other mature and/or developing economy in a lot of ways, including the political structure, legal system and economic development. Scholars and researchers are trying to understand the reasons for Chinese success and explore whether the Chinese experience can be learned and applied to other economies.

The fast growing economy has inevitably left a number of issues behind. One of the most significant problems is the structure of the Chinese financial system. Traditional financing channels refer to banks and financial markets (stock markets and bond markets) (Allen et al., 2012). The Chinese financial system is dominated by a large banking system, and bank loans are the major formal financing channels in China. The Chinese banking sector is controlled by four state-owned banks[1] and a large number of disproportionate bank loans are allocated to State-Owned Enterprises (SOEs) and large enterprises (Wei and Wang, 1997). SMEs in their early[2] stages of development face higher asymmetric

[1] The four state-owned banks are Bank of China (BOC), the China Construction Bank (CCB), the Agricultural Bank of China (ABC), and the Industrial and Commercial Bank of China (ICBC).
[2] According to EVCA (2004) report, early stage is defined as the stage for product development and initial marketing, manufacturing and sales activities.

information due to the lack of transparency and access. This problem can be more severe for young technology-based firms since the owners are less reluctant to provide full information about their knowledge and core technology. For those reasons, the banking institutions face higher costs in obtaining information and they have less incentive to conduct loans to the SMEs. Hence, firms in the private sector have restricted and limited access to bank loans. In contrast to China's superb banking system which is among the biggest and most profitable in the world (see *'Too big to fall', the Economist*), its equity and bond markets are underdevelopment and much smaller than those in other countries. The Chinese stock markets were established as a vehicle for privatization by the government rather than a capital-raising market for firms with growth opportunities (Wang et al., 2001). The IPO listing process is tightly controlled by the Chinese Securities Regularity Commission (CSRC) with a preference of financing large mature firms and state-backed firms. It was not until 2004 when the SME stock board was set up to help small and medium sized enterprises (SMEs) listing in China. Nevertheless, the Chinese stock market is also regarded as one of the poorest functioning stock markets (Durnev et al., 2003). The Chinese corporate bond market is suffering from a shortage of institutional investors and credit rating agencies to help price the debt accurately (Ayyagari et al., 2010). Consequently, there is a lack of formal financing channels for Chinese private firms, especially for SMEs. As reported by the National Bureau of Statistics, SMEs contributed 58.5% of GDP by the end of 2012. In sharp contrast to their large contribution to the Chinese economy and the concentrated loans offered to SOEs, SMEs use only 20% of China's formal financial resources. Under such situation, SMEs have switched to

alternative informal financing channels[3]. The emergence of the private equity investment represents the most suitable channel in providing financing for SMEs.

Private equity is finance provided to high potential growth companies in return for an equity transformed to the investors (BVCA, 2011). PE firms raise funds from institutional investors such as pension funds, insurance companies and high net worth individuals (BVCA, 2011). PE investors use these funds, sometimes along with PE manager's own money, to invest in firms with growth potential and to take an active role in monitoring and advising portfolio firms (Fenn et al., 1998).

PE investors are normally labeled as financial sponsors, who acquire large ownership stakes and take an active role in monitoring and advising portfolio firms (Fenn et al., 1998). Following the definition submitted by EVCA (2004), the term private equity comprises all types of venture investment, buyout and mezzanine investment (to be discussed in chapter 2). PE investors aim to finance young entrepreneurs and high-tech firms, which are characterized as a lack of sufficient funds to drive innovation and growth.

PE industry has experienced an impressive global growth in the US and the Europe at the beginning of the 21st century (Sommer, 2013). Accordingly, a large number of academic literature has largely focused on these mature markets, given the information available

[3] Informal financing channels in China are defined as everything that is not bank financing, since the banking sector is the largest component of the formal financial sector (Allen et al., 2005). According to Tsai (2004), informal financing includes, but is not restricted to, trade credit, interpersonal borrowing (money from friends or families), private money houses, pawnshops and community cooperatives. Allen et al (2005) argue that Chinese firms rely on informal financing channels rather than formal external financing due to weaker legal protection and poorer access to formal financing channels. Among the different types of informal financing channels, private equity investment is regarded as one of the most popular informal financing channels (BVCA, 2012).

for both PE investors and PE portfolio firms (Stromberg, 2009). Moreover, these studies focus either on early stage venture capital investment or on late stage buyout investment. It seems reasonable to assume that not all results found in the US and Europe countries can be true for emerging markets such as China. Especially given that the Chinese PE market has the following characteristics: (1) The majority of private SMEs have limited access to formal financing channels and therefore they have to rely on informal financing channels. This suggests that the demand for PE investment can be extreme. (2) The Chinese PE market was driven by the booming stock market after the setting up of SME board and ChiNext board in 2004 and 2009 respectively. As a result, pre-IPO and growth capital are the two most commonly found PE types in China. (3) Chinese corporations have their own characteristics, which are summarized by Bai et al (2004) as follows: (a) The executive compensation system is not well designed and normally contains undisclosed information. (b) Financial transparency is poor and local accounting firms cannot always be trusted. (c) Corporate control is found to be almost missing in China. (d) A concentrated ownership structure is found in most Chinese firms. A large percentage of non-tradable shares and state-owned shares are shown to have negative impact on corporate governance before 2005. (e) The external legal infrastructure is inefficient and offers little protection for minority shareholders, thus accelerating the conflict between majority and minority shareholders. Firms from mature market economies normally have a well-dispersed ownership structure before receiving PE investment. In contrast, Chinese firms are normally accompanied with a concentrated ownership and sometimes even a single largest shareholder. In many cases, this largest shareholder has some relationships with the state or a state related agency. This feature of Chinese corporate governance

implies that the entry and the impact of PE investment on portfolio firms' corporate governance can be different from mature market observations. For example, a consequence of focusing on pre-IPO and growth capital is that, investors normally become minority shareholders rather than the controlling shareholder in the portfolio firms from mature markets. Therefore these PE investors have less influence on corporate governance and transfer fewer value-added activities to the portfolio firm. (4) PE investment in China mainly uses IPO as an exit channel, especially after the setting up of two new stock boards in 2004, which is in sharp contrast to the trade sales exit channel in western countries. (5) The majority of PE investment in China is made by domestic investors but each deal size is relatively small. In contrast, foreign PE investors make a small amount of large investments. These background information suggests that PE investment may perform differently in their Chinese portfolio firms. Therefore, it is very important for both academics and practitioners to understand the differences between the Chinese PE market and PE market in more mature financial systems.

In recent years, several studies have focused on this fast-growing PE market and provided different opinions on it. These studies mainly focus on PE-backed IPOs (Zhang and Li, 2012; Tan et al., 2013 and Jiang et al., 2014). Surprisingly, these three studies provide contradictory results regarding the effect of PE/VC investment on IPO underpricing in Chinese portfolio firms (to be discussed in chapter 6). Apart from focusing on stock market performance, Guo and Jiang (2013) compare VC-backed firms to non-VC-backed firms and find that VC investment leads to better profitability performance and increased labour productivity. One of their explanations for better post-investment performance is

VCs' better selection skills in identifying firms with substantial development potential. Although these studies have provided different explanations on Chinese portfolio firms, there remain some unanswered questions on the Chinese market, such as: (1) These studies do not differentiate PE and VC investment (the differences between PE and VC will be discussed in details in chapter 2). In our opinion, VCs tend to invest at an early stage of their portfolio firms and most of the IPO related PE investment should not be categorized as VC investment, but rather, as growth capital. Hence, using the definition PE instead of VC is more accurate and can include more PE types. (2) Due to the limitations of the disclosed information, most sample size in existing studies is relatively small and does not cover a long sample period. For example, these studies focus on the sample firms before 2007 (which is regarded as the start of a booming PE market in China), such as Guo and Jiang (2013), or focus only on new board listed firms, such as Zhang and Li (2012), Tan et al (2013), Cao et al (2014) and Jiang et al (2014). (3) It is still unclear how the different types of PE approach affect the ex-post performance of their portfolio firms, especially in the long run. (4) There are some inconsistent results on how PE affects IPO performance and a lack of convincing explanation of the role PE investors during the IPO process. (5) The motivation for Chinese firms to receiving PE investment remains unveiled.

This study intends to add further insights into complement recent developments of the Chinese PE market and our study differs from the existing studies in the following ways. First of all, we take into account the dynamics of the Chinese PE market and focus on the PE-backed listed firms. The reason for focusing on listed firms is that listed firms offer

more accurate accounting information and allow us to access more details on shareholder and corporate governance operation. Secondly, the three empirical chapters, including the motivation for receiving PE investment, the accounting and stock market performance affected by the inflow of PE investment, will enable us to get a comprehensive understanding on how PE investment helps to change the operation and behaviour of these PE-backed listed firms. These steps help to add Chinese evidence into the general PE studies. In the subsequent sections, we will introduce the objective of this study in more details and explain what is new in our studies in comparison to the existing ones.

1.2 Objective

The objective of this thesis is to provide an overall picture of PE market in China by investigating both the accounting and stock market performance of the PE-backed Chinese mainland list firms and argue whether they perform differently from the existing literature. In chapter 3, the theoretical framework of the study is provided based on an extensive literature review, leading to several hypotheses to be tested in the following empirical chapters. In chapter 4, we examine the motivations for Chinese portfolio firms in receiving PE investment. We try to understand why these portfolio firms tend to receive PE investment and whether their motivations are different from the existing literature. In chapter 5, we analyze how PE affects their portfolio firms' performance in both short and long term. More precisely, we focus on how the post-investment changes can be explained by general theories and whether the effects vary according to factors such as stock boards, state-background and PE investors. In chapter 6, we compare IPO underpricing and underperformance between PE-backed IPOs and non-PE-backed IPOs. We are

particularly interested in the role of PE investment during the IPO process and compare it to general findings.

1.3 Contributions

In this thesis, we add some new evidence by revealing Chinese characteristics to the standard PE literature based on mature markets. We also make an explicit connection between the Chinese IPO market and the Chinese PE market. First of all, chapter 4 seeks to develop a deep understanding of the reasons and the factors that motivate firms to receive PE investment in China. In particular, this chapter finds that explanations from the existing studies may not be true to explain the Chinese case. Our findings indicate that financing for investment and growth and signaling effect are not the main reasons for receiving PE investment. Unlike studies from western countries highlight the entry of PE investment with the ability to reduce the principal-agency conflict, we raise the issue that PE entry as a minority shareholder does not have a significant impact on corporate governance which motivates firms with a concentrated ownership to undertake PE investment. Our analyses in this chapter contribute to existing literature in comparing the motivation factors from western countries and providing a different insight from the perspective of agency theory showing a different role of agency theory in motivating PE investment in China. Secondly, chapter 5 examines the real effect of PE investment on portfolio firms' operation performance. The findings indicate that PE investment in Chinese listed firms is short term profit-oriented rather than improving firm performance for portfolio firms in the long run. Our analyses in this chapter contribute to the literature by showing a different role of PE investment in a fast growing economy like China and

provide new explanations by extending the present US and European focused literature. Thirdly, chapter 6 compares the underpricing performance between PE-backed and non-PE-backed IPOs. After rejecting other possible explanations, we attribute the lower-underpricing of PE investment to the speculation behaviour of PE investors. This chapter not only develops a deeper understanding on PE investment in different stock markets, but also complements chapter 4 and 5 in developing a comprehensive understanding on Chinese PE market.

1.4 Thesis Structure

In chapter 2, an overview of the PE investment in China is provided, including a general introduction to PE investment, the evolution of PE industry in China; an overview of the Chinese PE market and a comparison of Chinese PE market and the West. The purpose of chapter 2 is to provide preliminary but useful background information on Chinese PE market which helps to pave the way for the following empirical chapters.

Chapter 3 provides the theoretical framework for this study based on an extensive literature review. Financial theories have been taken into account from the aggregate level to the industry level. There are five starting points to reveal the drivers of PE investment and the impact of PE investment on portfolio firms, including: the neoclassical theory, the financing for development and growth theory, the asymmetric information theory, the agency theory and the institutional theory. At the end of each theory, we propose the hypotheses to be tested in the following empirical chapters.

In chapter 4, we investigate the factors that motivate firms to receive PE investment in China. Using the Propensity Score Methods, we compare similar firms with and without PE investment and test the motivation proxies constructed from the general literature, including 195 PE-backed firms and 318 non-PE-backed firms from 2000-2011. Results from both Logit and Probit model show that, among the three possible types of motivation for undertaking PE investment, financing and signaling as motivation for PE investment in China are not accepted. As for agency theory, firms with a dominant largest shareholder become highly motivated to receive PE investment because PE investors normally become minority shareholders in the portfolio firms and play a limited role on corporate governance. To check robustness, we verify our findings by focusing on new board listed firms. The results confirm that the largest shareholder plays a positive role in receiving PE investment. In another robustness check, the stock market event study provides evidence that the announcement of PE investment does not lead to significant stock market returns for PE-backed listed firms. This chapter provides some new insights into the motivation for receiving PE investment by taking into account the corporate government structure of Chinese firms and the characteristics of Chinese PE market. A good understanding of the motivation for firms to receive PE investment helps understand PE impacts in the next two chapters.

In chapter 5, we examine how PE investment affects Chinese portfolio firms during the period from 2000 to 2011 using regression models, including 364 PE deals from 307 PE-backed listed firms. We confirm that the inflow of PE investment leads to better post-investment performance in the short run, although the PE amount is relatively small

compared to firm size. Because PE investors' role as minority shareholders, they have less incentive in evolving into corporate government, which is consistent with the insignificant or even negative relationship between PE deal stake and firm performance. The prior finding is consistent with the general literature while the latter highlights the issue of lack of incentives in management for PE investors in China. Moreover, we notice that PE investment before IPO leads to an immediate profit increase for portfolio firms, confirming the advantage of PE investment in providing quick financial support and boosting firm's accounting performance. Our robustness check is based on different types of PE portfolio firms and different PE investors. Firstly, the result shows that PE investment has higher impact on new board listed firms than on main board listed firms due to the smaller size and risky nature of new board listed firms. In addition, the short-term profit orientation of PE investment may create conflict between PE investors and recipient firms, which is observed as a negative relationship of PE deal stake for new board group. Secondly, the entry PE investors do not have a significant impact on the performance of PE portfolio firms with state-ownership, suggesting that financing purpose is not a necessary reason for undertaking PE investment. Thirdly, domestic PE investors and non-syndicated PE investors have greater impacts on portfolio firms than their counterparts, suggesting a better market understanding and a stronger single investor monitoring effect from both types of PE investors. Consistent with the fact that Chinese PE market is driven by IPO, PE investment shows no significant impact on profitability in the long run. The evidence obtained from the long run suggests that most PE investors are short-term-profit driven and their roles are mostly related to help with IPO listing. By using a large sample of firms in the 2000-2011 period, we provide a clear understanding

regarding the impact of PE investment on its portfolio firms and the difference role between groups and over time. Our results suggest that the Chinese PE market has been IPO driven especially after the setting up of two new stock boards in 2004. In conclusion, Chinese IPOs have been used as speculation channels by PE investors to get returns in short period. These results help to provide updated evidence for both general PE literature and Chinese PE literature.

In chapter 6, we evaluate the role of PE investment during the initial public offering process by comparing 295 PE-backed and 1005 non-PE-backed listed firms from 2001-2011. From the Heckman model results, we notice that PE-backed IPOs experience lower underpricing than non PE-backed IPOs. To verify the underlying reason for the lower IPO underpricing, we narrow down our sample to PE-backed IPOs only and find that the amount of PE investment has a negatively significant relationship with the underpricing ratio, which may be due to PE investors with large amount of PE investments are more willing to set up high offering price in the hope of benefitting from the initial IPO returns. After denying the generally acknowledged underpricing factors like PE reputation factor and the corporate governance role of PE investment, we finally attribute the lower underpricing to the speculation behaviour of PE investors in Chinese stock markets. From robustness test results, new boards' listed firms experience higher speculation than their main board peers, while Chinese domestic PE investors lead to lower underpricing than non-domestic PE investors. Based on these findings, we expand our sample period to 12-months and 24-months and we find that PE investment has no impact in these periods. The results further confirm the speculative behaviour of PE investors from the previous

chapter. In sum, this chapter provides similar observations to mature market evidence by showing PE-backed IPOs experience lower underpricing but using a different explanation. Instead of focusing solely on VC-backed IPOs, our PE-backed IPO sample is much larger and covers the major development period of PE industry in China. Our results also provide new insights by excluding other possible channels that may cause lower underpricing and indicate the speculation behaviour of PE investors in China. The findings from this chapter are also consistent with our observations from the previous two empirical chapters in confirming PE investors are short-term profit oriented.

1.5 Data

The data information used in this dataset is a combination of firms' accounting-based information, stock market information and PE investment information. Two main data sources are used. The first is from the GTA Research Service Centre in Shenzhen (GTA Information Technology Company Limited)[4]. In this dataset, the China Stock Market Financial Statements Database provides the balance sheet and the cash flow statement information for chapters 4, 5 and 6; in which the China Listed Firms Corporate Governance Research Database provides the data information for variables used in chapter 4; its China Stock Market Trading Database also provides variables for use in chapter 6. The other main dataset in use is the Asian Venture Capital Journal Database (Asian Venture Capital Journal database)[5]. AVCJ helps to provide the PE investment

[4] The CSMAR Database is the most widely used dataset providing China financial data. It has seven major database series, with more than 60 datasets covering stock market, corporate, bond, funds, industry and economy.
[5] The AVCJ Database provides Asian private equity, venture capital and M&A industries' information to advisory, financial, legal and technological services. AVCJ has been on the ground in the Asian market for more than 20 years and possesses the longest and deepest track record in Asia. This dataset provides users with access to more than 113800 companies along with facts and figures on over 84000 transactions.

related information that is used in chapters 5 and 6. Besides, some of the PE investor information is hand collected from the investors' individual websites.

The sample period for all three empirical chapters runs from 2000 to 2011. All of the firms in our sample are currently listed on the Chinese mainland stock markets. The PE-backed financial firms are excluded as well as firms without sufficient accounting and corporate governance information. As indicated previously, the reason for using only listed firms in our sample is that these firms provide more accessible and reliable public information. Moreover, we can get accurate corporate governance, shareholder information (used in chapter 4) and stock market information (used in chapter 6) from these listed firms. PE transaction information and PE investor information used in chapters 4 and 6 are collected in the year of investment. For chapter 4, the variables used are yearly accounting information, including PE investment year and the first and second year after PE investment information. For chapter 5, the variables used are yearly accounting and governance information before the PE investment year. For chapter 6, the IPO day share information is used for short-run underpricing testing. The monthly stock information for 12-month and 24-month periods are collected (excluding the IPO month) for long-run underperformance testing.

Besides the use of firm and PE information from the two datasets mentioned above, we also make use of PE investors' self-reported information which is available from their own websites. Such information is mainly used for explaining the types of PE investors in China in chapter 2. We also use some of the PE investors' information, such as firm

age in chapter 4 when differentiating PE investor characteristics.

Chapter 2 PE in China

An in-depth analysis of the Chinese PE market requires a comprehensive understanding of PE investment field. The operation of PE investment in China began in the early 1980s. In the past three decades, there have been many examples of successful as well as failed PE deals from both domestic investor and foreign investors in China. During this period, the Chinese government endorsed an aggressive investment strategy and great support in this industry's deregulation, providing new PE exit channels and in rebalancing supply and demand of PE capital. The structure and development of the Chinese PE market has been introduced by a number of scholars, including Ahlstrom and Bruton (2006), Bruton and Ahlstrom (2003), Batjargal and Liu (2004), Wright et al (2011), Zhang and Li (2012) and Tan et al (2012), Zhang and Li (2012), Guo and Jiang (2013), Jiang et al (2014), Cao et al. (2014). In light of the recent development of the Chinese PE market, this chapter updates these early studies in the following ways. Firstly, we provide a detailed explanation on private equity investment. Secondly, we provide an overview of the Chinese PE market, including the 4 stages of PE[6] market development, PE related laws and regulations and a classification of PE investors in China. Lastly, we compare the Chinese PE market and other mature PE markets by indicating the differences between the two types of market.

[6] While the whole thesis has a clear focus on PE investment only (that is the investment targets of established firms), the venture capital investment is taken into account in this chapter in particular. This is because we aim to provide a full picture of the development of PE industry in China since the early 1980s and VC investment is an important component at the beginning of this period. As a result, in this chapter, the definition of PE covers both venture capital and private equity investment.

2.1 An overview of PE investment

2.1.1 What is PE?

PE is a type of financing provided medium to long-term finance, in return for an equity stake in an underperformance firms or firms with high potential of growth (EVCA, 2004). PE target firms range from business start-ups to large, mature quoted companies, including firms at different development stages. PE fund is operated under a PE fund manager who is also responsible for managing the portfolio firms (Gilligan and Wright, 2010). PE investment is structured with an exit purpose. PE funds are normally raised from external investors, such as pension funds, insurance companies, endowments and high net wealth individuals. The investment period ranges from 3 to 10 years depending on the PE type (Meuleman et al., 2009; Jelic et al., 2005; Gilligan and Wright, 2010). PE investment was historically made in non-listed firms, but nowadays PE also make investment in publicly held firms. PE revenue is created through active management of PE managers, who used to be an expert from a certain field and become a board member during the investment period. PE investor provides not only financial support but also human capital investment through managerial, operational and technical expertise (Bultler, 2011).

PE investment can be divided into different types according to the timing of PE entry. Early studies roughly categorize PE investment into venture capital and buyout. The category also depends on different country of origin. In Europe, PE represents both venture capital and management buy-outs and buy-ins. On the contrary, PE (mainly refers

to buy-outs) and VC are treated as separate types of investment in the US. In academic studies, Lerner et al (2012) categorize private equity into venture capital, leveraged buyouts and mezzanine investments. Venture capital refers to equity investments target early stage and expanding companies, including seed, start-up (within three years of firms' establishment) and early stages of development. Whilst buyouts refer to investments made into more mature firms (Sommer, 2013). Buyout investment aims to reduce inefficiencies, driving firms' future growth through new margins and/or new sources EVCA (2004).

With the development of the PE market, PE types can now be classified into more precisely specified subgroups. According to the financing stage, PE investment can be divided into early stage investment, expansion stage investment, mezzanine stage investment, buyout stage investment and late stage investment, according to the AVCJ dataset.

- The early stage investment is the financing provided to start-up companies with financing difficulties, including two PE types: (1) Seed PE type, which is designed to research, access and develop an idea or financing that allows a business concept to be developed. Business angels are the main investors at this stage. (2) Start-up PE type refers to financing provided to companies in product development and initial marketing. At this stage, the capital is mainly required for product research and development and personnel training.
- The expansion stage investment, also called 'development stage', refers to funds provided for firms at their growth and expansion stage. In this period, the inflow

of capital is mainly used to increase production capacity and sales power, to develop new products, finance acquisitions and/or increase the working capital of the business. This expansion stage investment includes three PE types: (1) Growth capital type which provides financing for growth and expansion of an operating company with trading profitably. (2) Bridge loan type, financing made available to a company in the period of transition from being privately owned to being publicly quoted. (3) Franchise funding type, in which financing is provided to a company with franchise in a particular area for further development.

- In the mezzanine stage, a hybrid of debt and equity financing is typically used to finance the expansion of existing companies. This stage includes three types of investment. (1) Pre-IPO type, financing provided to help a company to go public. (2) Private investment in public companies (PIPE) type, financing provided to entrepreneur-driven listed companies for rapid growth.
- The buyout stage is reached when the current management team (in the case of a managerial buyout, MBO) or a new team (in the case of a managerial buyin, MBI), together with PE investors, invests into the mature portfolio firms and acquire an existing product line or business. There exists another type of buyout called the 'secondary buyout', in which a PE investor sells its investment to another PE firm or financial sponsor thereby ending its involvement in the current investment. Secondary buyout is commonly used for PE exit.
- The late stage PE investment provides funds for firms at their business turning point and includes the turnaround type. The turnaround PE type is financing provided to re-establish a business which has encountered performance

difficulties. A table of PE types is summarized in Appendix 2.1.

In some studies, PE also covers 'angel capital' as well as 'informal financing market', but neither is included in this thesis.

The definition and classification of PE investment used in this thesis mainly follows categorization from the AVCJ database, the source of our PE information, which contains both mezzanine investments and leveraged buyouts PE types.

We also summarize both academic and non-academic PE sources and report them in Appendix 2.2.

2.1.2 PE fund structure, process, performance and exit

PE funds are raised from investors internationally, including funds from institutions (such as public pension funds, insurance companies, securities companies, corporations, state owned enterprises, government and banks) and high-net-worth individuals. These investors are generally liable for the amount of capital they invest as limited partners (LPs). The fund manager, also called the general partner (GP), is responsible for fund performance and helps with fundraising and fund management (Meuleman et al., 2009; Jelic et al., 2005; Gilligan and Wright, 2010).

A PE fund manager has the following four principal roles:

- PE fund managers raise funds from limited partners both domestically and

internationally. The limited partners are usually institutions such as pension funds, endowments, banks, insurance companies and wealthy individuals (Fenn et al., 1998). In many cases, PE fund managers even invest their own money into the fund for the purpose of insuring other limited partners and to raise more funds from these investors, especially in the case of buyouts;

- PE fund managers search investment opportunities and make investments. PE managers, who used to be investment bankers, accountants, consultants, have accumulated experience relating to a specific industry. The role of PE managers includes finding the right portfolio firms and ensuring a successful exit with high returns for LPs. The screening and evaluation of investments process are time consuming and often follows a structured and standardized approach (Kaplan and Strömberg, 2001). After the initial offer is accepted by the portfolio firm or the selling party, PE firm or the bidders have the opportunities to conduct their due diligence, in which they have access to the firm's financial information (Povaly, 2007). Two methods are commonly used in selecting a PE portfolio firm[7]. After the due diligence process, the two parties start negotiating the investment agreement which includes purchase price and governance aspects relating to the investment (Sommer, 2013). Once the transaction is set up, the proportion of ownership will be transformed to PE investors and they will start their

[7] The first method is to compare the potential portfolio firms to a firm from the same industry with similar characteristics, which helps to control for economic and other external factors that influence the firm's valuation. This procedure helps provide a quick and easy way to get a rough evaluation. However, this method can be inaccurate in lots of ways. For example, it is hard to find a comparable private firm, especially for unlisted and start-up firms. It is also difficult to calculate cash flow for a private firm if there is undisclosed accounting information. There is a second method which focuses on using Discounted Cash Flow Analysis (DCF). The concept for DCF analysis is that the value of a given business equals the sum of all future cash flows of the business discounted to reflect the current value, i.e., using a discount rate equivalent to the cost of equity and/or cost of debt and/or cost of capital. However, the problem of DCF is that a DCF valuation is only valid when the assumptions on discount rate, cash flow, life span and growth rate are not off-target.

management in the portfolio firms (Fenn et al., 1998).

- PE fund managers play an active management role in portfolio firms. Once the PE transaction has been set up, PE managers evolve into actual management of the business, including intensive monitoring of their portfolio firms, obtaining regular reports on performance, visiting the firm and regularly attending board meetings. PE managers do not normally exercise day-to-day managerial activities (Gilligan and Wright, 2010). In some cases, PE managers only become board members, help provide advises on decision making and serve as the advisory board (Povaly, 2007). One of the core advantages of receiving PE investment is the value-added activities transformed from PE investors, which contains industry experience transferred from similar investment experience, better use of financial discipline and better contracts offered by suppliers or customers (Gilligan and Wright, 2010; Povaly, 2007).
- PE managers are responsible for PE exit. PE transactions are structured with an exit purpose from 3 to 10 years specified in contract details. The right exit option should ensure positive profitability for LPs. The generally used exit channels include: flotation, trading sales and liquidation[8] (Gilligan and Wright, 2010;

[8] Flotation means listing on a stock market. A number of countries have created secondary stock markets for the purpose of helping young firms achieve listing under relaxed listing rules. For example, NASDAQ in the US, AIM in the UK, GEM board in Hong Kong and ChiNext board in Mainland China. Most of the PE portfolio firms regard listing on these stock boards as a PE exit route. When the lock-up period ends after one year of IPO listing, PE investors are allowed to sell the shares they are holding in the secondary market to cash out PE funds. Trading sales means PE investors sell the company to another firm or to the current management team, or even to another PE investor (in the case of secondary buyout). The acquiring company, in many cases, is from the same industry, seeking to buy a competitor for the purpose of decreasing competition and gaining access to innovative technology. Due to the buyers' existing detailed knowledge of the industry and the firm, the portfolio firm has a reduced chance of overvaluing its business. Therefore, trading sales will generate a smaller profit than stock market floatation. For the buyout PE type, there is a growing trend of secondary buyout, i.e., PE investors sell the investment in the portfolio firm to another PE firm. The attraction of a secondary buyout is the instant liquidity it offers. The liquidation option is used in the case of severely distressed investment.

Povaly, 2007).

The PE managers' compensation is made up of two parts: management fees and carried interest. The management fee is meant to cover the cost of managing the fund, which is normally calculated as a percentage of funds raised. The prevailing pattern for management fee is 2% per annum. The larger the fund, the greater the management fee. The carried interest is a share of profits paid to the fund manager as a compensation. This type of compensation aims to motivate the fund manager to work towards improving the fund's performance. The amount of carried interest is normally around 20-25% depending on fund performance (Metrick and Yasuda, 2010; Gompers and Lerner, 2000, Robinson and Sensoy, 2013).

PE firm's reputation can largely affect the selection of portfolio firms. A number of indicators have been illustrated as reputation indicators, such as managers' experience (Lerner, 1998; Kaplan and Schoar, 2005; Janney and Folta, 2006) and the number of portfolio firms under management (Bernile et al., 2007; Keuschnigg, 2004). In addition, Balboa and Marti (2007) indicate that when PE investor is related to a national level association, such as a member of the national venture capital and private equity association, a higher signaling effect is expected. According to a report from EVCA (2004), the largest amount of PE investors choose to locate their headquarters in the capital of the country to ensure the quality of portfolio firms.

PE fund performance can be measured by using Cumulative Net Cash Flow (CNCF), Interim Return on Investment (ROI), Interim Internal Rate of Return IRR and Investment

Multiple[9] (Goldman Sachs, 2006). IRR and Multiple are popular in academic studies regarding PE performance. More commonly, both measurements are used to illustrate the original returns. For example, a higher Multiple combined with a lower IRR would indicate that the returns have been achieved over a longer period. Conversely, a higher IRR over a shorter period may be based on a small absolute gain. The PE fund performance is often described as the 'J-Curve Effect', which commonly refers to the negative cash flow and poor performance observed in the early stage of a PE investment but increase in the long run (Goldman Sachs, 2006). The decline in performance in the early years of the fund is caused by the impact of management fees and the build-up of the investment and the performance is seen to become positive after some turning points.

2.2 Evolution of PE industry in China

This section contains an introduction of the Chinese PE market. We summarize four stages of PE market developed in China from the early 1980s until the end of 2011[10].

2.2.1 Four stages of PE market trends and developments in China

Historically, the evolution of Chinese private equity industry can be divided into four stages. The first stage was signaled by the set-up of the first venture capital firm in the

[9] The Cumulative Net Cash Flow (CNCF), is the sum of total cash flows to and from an investment. The Interim Return on Investment (ROI) is all the directly attributable net cash flow benefit arising from the interim assignment/Cost of the interim management assignment. IRR is the discount rate that ensures that the net present value (NPV) of a series of (positive and negative) cash flows is equal to zero. The investment multiple is calculated by dividing the fund's cumulative distributions and residual value by the paid-in capital.

[10] The introduction includes the development of Chinese PE market until the end of 2011, which is consistent with our sample period. The development of Chinese PE market after 2011 can be found in the conclusion in Chapter 7, where we provide an overview of the latest PE market development and future work.

early 1980s. The second stage was accompanied with the dot-com boom in the early 2000. And the third stage is signaled by the setting up of SME board in 2004, in which PE exit channel has been provided. The last stage is the phase correction of PE market in China after 2011 (Licai, 2012; Noah, 2010).

The first stage of PE investment in China was regarded as the exploration stage, meaning the initial entry and set up of VC firms in China is influenced by the fast development in mature markets (Licai, 2012; Noah, 2010). The initial stage resulted from the successful economic reform introduced by Deng Xiaoping in the late 1970s and early 1980s opened the door to private ownership for PE investors with the purpose of solving financing issues and to foster innovation (White et al., 2005; Kim, 2014). To describe the development process of PE industry, we illustrate the notable events as follows:

- The first private equity fund company, ChinaVest (*ZhongChuang*), was established in 1986 and funded by the central government. The main purpose was to support the development of high-tech companies in the country, in which the majority of the portfolio firms are subordinate enterprises from the central and local ministries. However, due to the heavy administrative intervention and a lack of formalized operation structural and legal protection framework, the collaborations between VC investors and the portfolio firms did not go on well. The problems existed not only in finding good investment projects but also in the scarcity of exit channels – at that time the domestic stock market was at its infant stage and listing abroad was difficult (White et al., 2005; Kim, 2014).
- International VC investors also made their first move to the Chinese market in this

first stage. In 1993, IDG was the pioneer firm to set up a subsidiary funding firm called IDGVC Partners which focuses on small and medium sized high-tech firms in China. After IDG, a small number of other international VC firms, including Walden International, H&Q Asia Pacific and WI Harper Group entered the Chinese market[11]. Nevertheless, the majority of these international VC investors took a wait-and-see attitude for setting up investment funding in China at that moment. According to them, 'the related investment environment in China has not been significantly improved' (Noah, 2010). In the initial years of its entry (1992-1997), IDG has only undertaken very few VC cases and the deal size for each case is relatively small (Noah, 2010).

- Although the first stage of PE development was sketched as 'to find their ways in the dark tunnel' for both domestic and overseas VC investors, the number of VC investors has increased from 53 to 266 and VC funds increased from 5.3 billion to 40 billion (RMB) (Zhu, 2010).

The second stage started in the early 2000s, which was regarded as the fast growing period of PE industry in China but it ended up with a failure due to the worldwide Dotcom bubble burst (Licai, 2012; Noah, 2010).

- In this stage, the government adopted several political measures to enhance further development of the PE market. The first significance case at this stage was signaled by the approval of *Procedures for the Management of China's Industrial Investment Funds from Abroad* (expired) in 1995, which helped further standardize foreign VCs to invest in China. Under this regulation, foreign VC firms either set up China-

[11] Information available from IDGVC website: http://www.idgvc.com/en

focused VC fund (for example, Sequoia), or adopted the form of joint-venture (for example, DFJ Dragon Fund China), and a large amount of VC firms chose to hire local people for establishing local subsidiaries (such as NEA, DCM and Redpoint). In the environment of the Global Internet Boom, most of the VC investors focused on internet related companies (such as *Sina*, *Sohu* and *Alibaba*) and most of these investments were a great success. China's four biggest web portals, Sohu, Sina, Tencent and Netease, all went public in the US stock markets in the early 2000s (Liu, 2014).

- Inspired by these successful investments, the government issued *the Decision of the CPC Central Committee and State Council on Strengthening Technical Innovation, Development of High-tech and Realization and Its Industrialization*, aiming to motivate innovation and the development of new and high-tech enterprises. Following this trend, local governments set up their own venture capital firms to boost the development of local firms. One of the most representative local venture capital firms is the Shenzhen Capital Group Co. Ltd.,[12] founded in 1999 with registered capital of 1.6 billion RMB. The shareholders of this company include the Shenzhen government, the State-owned Assets Supervision and Administration Commission (SASAC) and several other state-owned firms. Over the next 12 years (1999-2011), Shenzhen Capital Group made 478 PE investments worth 13.2 billion RMB and is regarded as one of the most successful domestic VC firms (Hannas, et al., 2013).
- In November 1999, the State Development Planning Commission issued *Establishing*

[12] Information generated from Shenzhen Capital Group Co. Ltd website: http://www.szvc.com.cn/

a Venture Investment Mechanism - Several Opinions, which was regarded as the first strategic document for VC industry in China. This document stated the basic principles for establishing the venture investment mechanism in China. One of the key declaration was to '*foster a capital market to conduct the development of high and new technology industries and to establish a venture investment mechanism progressively*'. This document has helped to formalize the setting up of VC funds as well as encouraging the entry of VC investors (Yu, 2007).

- While motivating the establishment of VC firms, the central government also started to work on providing efficient PE exit routes since the early 2000. For example, the plan for setting up the Small and Median Enterprises (SME) board in the Shenzhen Stock Exchange was regarded as an efficient PE exit channel and it improved the development of PE industry in China in subsequent years (Clark, 2008).
- In 2005, the 18th session of the Standing Committee of the 10th National People's Congress of the People's Republic of China adopted revised *Company Law and Securities Law*. The amended *Company Law* reduced the requirements on the ratio of non-patented technology investment in establishing a joint stock limited company and canceled the restrictions for domestic firms in making foreign investment[13]. The *Securities Law* lowered the requirements for start-up capital and initial IPO, facilitated the establishment and listing of SMEs, and thus provided more favorable conditions for PE investment in China. In 2006, the *revised Law of the People's Republic of China on Partnership Enterprises* established that a legal person can join partnership enterprises (Duan & Duan, 2006). In addition, the amended law indicates that the

[13] Information is collected from the Ministry of Commerce website.

number partners of a limited partnership enterprise should be no more than 50 and the tax for partnership enterprise is paid by individual partners. The new law enriches the PE organizational models by bringing international operation mechanisms and considerably reduces the investment risk for current and future investors. The revision of related laws has provided a better legal basis and promoted a good environment for China's PE investment.

- Nevertheless, the worldwide Dotcom crash in 2000 blocked further development of the Chinese PE market and most investors exited with failure (Jingu and Kamiyama, 2008).

The third stage of PE development was the fast growing period of PE industry in China. This stage is signaled by approval of the SME board in 2004.

- The year 2005 is regarded as a milestone for the PE industry in China. After 2005, the narrow sense PE investment[14] flooded into the Chinese market and replaced VC investment to become the main-stream investment type. In 2006, Coship Electronics Co. Ltd. became the first domestic venture capital-backed technology company to go public on the Shenzhen Stock Exchange.
- The goal for setting up the SME board was to provide an easier access channel for small and medium sized firms since they have difficulty in meeting listing requirements on the main boards. On 30 December, 2011, there were 646 companies listed on the SME Board with a total market capitalization of RMB 2.7 trillion (USD

[14] The narrow sense of PE investment found in China normally refers to Pre-IPO and growth capital type. (source: http://www.saepeg.com/)

428.6 billion), in which more than one third of the IPOs are backed with PE investment and the total IPO proceeds were worth RMB 558.8 billion (USD 88.7 billion)[15]. The launch of the SME Board was a major step towards the establishment of a multi-tier capital market system and helped to pave the way for a second board market. Following the setting up of the SME board, the ChiNext board for high-growth and high-tech firms was launched in October 2009. A number of changes have been implemented to offer lower market entry requirements for ChiNext listed firms. Table 2.1 presents a comparison on the listing requirements for different stock boards in detail. ChiNext has a lower listing requirement than Main board and SME board in terms of profitability, size of asset and share capital. For ChiNext listing, firms are required to have accumulated net profits of over RMB 10 million (US$1.6 million) in the past two financial years, compared to accumulated net profits of RMB 30 million (US$4.8 million) over the past three years for Main board and SME board listed firms. Moreover, the listing requirement for Main board and SME board of having 'a maximum of 20% intangible assets of new assets without accumulated losses in the latest year' was cancelled for ChiNext listed firms. In addition, ChiNext requires the issuer to have a certain level of innovative capability and ChiNext requires IPO firms with the following preferable background: high technology, fast growth, new economy, new service, new agriculture, new energy, new material and new business mode. For PE investors, the setting up of two new stock boards provides them with the best exit channel. The advantage of using IPO as exit channel will be further discussed in the following sections.

[15] Information is taken from: http://www.szse.cn/main/en/SMEBoard/

- One of the most representative cases in the third stage is shown by the US PE investor Newbridge Capital to become the first foreign shareholder in the Shenzhen Development Bank with 18% (worth $150 million) ownership control in 2004. The Shenzhen Development Bank become the first foreign-controlled commercial bank in China after this transaction. Inspired by this successful transaction, a number of international PE investors made their first move to the Chinese PE market, including some of the biggest investors such as: the Carlyle Group, the Blackstone Group, Kohlberg Kravis Rovers, TPG and Goldman Sachs Capital Partners. These international investors are more willing to target SOE firms because they realize their SOE partners can fulfill some important functions to meet the challenge of investing in China (EY, 2015). For example, regulators are pushing SOEs to spin off underperforming assets to strategic investors or private equity funds. SOEs are also seeking to cooperate with big international companies with PE (EY, 2015).
- From the regulator side, in 2005, the regulation '*Interim Measures for the Administration of Start-up Investment Enterprises*' was released to encourage investments in high-tech SMEs. In 2006, '*Law of People's Republic of China on Partnerships'* was amended. Under the new law, the government approves PE joint venture investment type, which is helpful in transforming experience from foreign PE firms to domestic PE firms. These positive signals from the government encourage the development of a Chinese PE market. In 2009, the NDRC (National Development and Reform Commission[16]) submitted *Administration of Private Equity Provisions* to

[16] The NDRC is responsible for state planning and macroeconomic policies in China. The role of NDRC will be further discussed in the next section.

the State Council for approval, which is regarded as the basic supervisory framework for PE industry in China. Further, on January 11, 2011, the Shanghai Municipal Government released its *Implementation Measures on Trial Projects of Foreign-Invested Equity Investment Enterprises in Shanghai* (the 'Shanghai RMB Fund Regulation'). This regulation is believed to be the first of many regulations designed to help large international institutional investors invest in Shanghai-based private equity funds (Shoesmith et al., 2011).

- In sum, the setting up of these two boards have greatly enhanced the PE market in China by providing the IPO exit channel and attracting more outside PE investors. The Chinese government also works as an accelerator during the whole process.

The fourth stage is regarded as the adjustment period of PE industry in China, which started late 2011 (Licai, 2012; Noah, 2010). A massive upsurge in the IPO-driven PE market was observed after the setting up of two new stock boards and IPO market soon became saturated and most IPOs fell in debut (meaning the IPO price is lower than the offering price). Consequently, PE industry in China cooled down and entered an ongoing adjustment period. Because our sample period runs from 2000-2011, we will not explain the fourth period in detail in this section. Instead, the current and latest development of PE industry in China will be further discussed in Chapter 7.

Table 2.1 Comparison of listing requirements between ChiNext board and other boards.

To illustrate how the setting up of new stock boards helped to provide an efficient exit channel for PE investment in China, we compare the listing requirements of ChiNext board and SME and Main board in the following table.

	ChiNext board	SME board, Main boards
Target	Innovative and growing start-ups	Mature SMEs Large and mature firms
Operating history (at least)	3 consecutive years	3 consecutive years
Profit	1. Consecutive profit over the past two years, cumulative net profit from the latest two years of not less than RMB 10 million (US$1.6m) and continued growth; or 2. Profitable past year and net profit of not less than RMB 5 million (US$0.8m), the revenue of the past year of not less than RMB 50 million (US$8.0m), or revenue growth rate over the past two years of not less than 30%. (These criteria are selective.)	1. Past three fiscal years positive and cumulative profit of over RMB 30 million (US$4.8m); 2. The net cash flows generated from operating activities over past three fiscal years of more than RMB 50 million (US$8.0m) in total; or over recent three fiscal years the operating revenues totaled more than RMB 30 million (US$4.8m); 3. In the latest year there is no accumulated loss.
Public held shares	25% of issued capital; OR 10% of issued capital if market capitalization is larger than RMB 400m (US$61M)	
Share capital	The total share capital after issuing no less than RMB30 million	The total share capital before issuing no less than RMB30 million
Asset	Net assets not less than RMB 20 million (US$3.2million).	The intangible assets not more than 20% of the net assets.
Core business	Over past two years core business has not changed.	Over past three years core business has not changed.
Directors, Management and actual controller	Over past two years directors, senior managers and actual controller have not changed.	Over past three years directors, senior managers and actual controller have not changed.
Growth and innovation capability	ChiNext board prefers companies with the following features: high technology, fast growth, new economy, new service, new agriculture, new energy, new material and new business mode.	
Review	The issuer's application documents are reviewed by ChiNext public offering review committee which is composed of 35 members.	The issuer's application documents are reviewed by Main Board public offering review committee which is composed of 25 members.

Source: Shanghai Stock Exchange official website and Shenzhen Stock Exchange official website.

2.2.1 PE related laws and regulations in China

In the previous section, we have mentioned some laws and regulations that affect PE investment in China, including *Company Law*, *Securities Law* and the *revised Law of the People's Republic of China on Partnership Enterprises* (Wang and Huang, 2008). In this section, we will expand the above discussions by adding in the regulatory body and the related law and regulations in China in details.

Under the *Provisional Measures on Administration of Venture Capital Investment Enterprises promulgated* in 2005, National Development and Reform Commission (NDRC) is authorized as the regulatory supervisor for VC industry in China[17]. Started from June 2008, NDRC designated six pilot regions, including Beijing, Tianjin, Shanghai, Jiangsu Province, Zhejiang Province and Hubei Province, to test the operation of private equity funds with the approval of the State Council. In these Pilot Regions, private equity investment enterprises ("EIE") and equity investment management enterprises ("EIME") are permitted to establish and operate under the supervision of NDRC[18] (Yong, 2012).

Both RMB-denominated funds and dollar-denominated funds are permitted in China, including the following types: foreign-owned USD private equity funds (FOPE), foreign-owned RMB private equity funds (FOPE-RMB), Chinese-owned USD private equity funds (COPE-USD), Chinese-owned RMB private equity funds (COPE), State-owned industrial RMB private equity funds (SOPE) and hybrid foreign/Chinese USD & RMB

[17] In 2013, central government has clarified VC/PE industry is under the supervision of CSRC.
[18] Later in 2014, *the Measures for the Registration and Archival Filing Regarding Private Equity Fund Managers (for Trial Implementation)* is issued in which all VC/PE institutes are asked to register with CSRC.

private equity funds (HOPE) (Yong, 2012). In Table 2.2, a summary of the laws and regulations related to PE funds in China are provided between 2001 and 2011[19]. This table contains information related to fund raising, fund establishment, types of investment and taxation of PE, which can reveal the gradual legal development process of the Chinese VC/PE market.

[19] Information source: *Laws and Regulations of VC/PE Funds in China 2013*, by China Venture Capital and Private Equity Association.

Table 2.2 A summary of Chinese VC/PE related laws and regulations 2001-2011

Type	Title	Code
Fund raising	*Interim Provisions on the Administration of Investment by the National Social Security Fund*	Order No. 12 [2001] of the National Council for Social Security Funds
	Circular of the Ministry of Finance and the Ministry of Science and Technology on Printing and Issuing the Provisional Measures for the Administration on the Guiding Funds for the Venture Capital Investment by the Small and Medium-sized Technology-based Enterprises	Order No. 128 [2007] of the Ministry of Finance and the Ministry of Science and Technology
	Notice of China Banking Regulatory Commission on Issuing the Guidelines for Trust Companies to Operate the Trust Private Equity Investment Business	Order No.45 [2008] of the China Banking Regulatory Commission
	Circular of the General Office of the State Council on Forwarding the Guiding Opinions of the National Development and Reform Commission, the Ministry of Finance and the Ministry of Commerce on Standardized Establishment and Operation of Venture Capital Guiding Fund	Order No. 116 [2008] of the General Office of the State Council
	Notice of the General Office of the China Banking Regulatory Commission on Further Regulating the Administration of the Reporting of the Personal Financial Management Business of Commercial Banks	Order No.172 [2009] of the General Office of the China Banking Regulatory Commission
	Interpretation of the Supreme People's Court of Several Issues on the Specific Application of Law in the Handling of Criminal Cases about Illegal Fund-raising	Order No.18 [2010] of the Supreme People's Court
	Circular on Printing and Distributing the Interim Measures for the Administration of Participation in the Venture Capital Fund by the New Industry Venture Capital Program	Order No. 668 [2011] of the Ministry of Finance and the National Development and Reform Commission
	Notice of the China Banking Regulatory Commission on Relevant Issues concerning Regulating the Investment Operation of Wealth Management Business of Commercial Banks	Order No. 8 [2013] of the China Banking Regulatory Commission
Fund establishment	*Provisions Concerning the Administration of Foreign-funded Business-starting Investment Enterprises*	Order No. 2 [2003] of the Ministry of Foreign Trade and Economic Cooperation, the Ministry of Science & Technology, the State Administration for Industry and Commerce, the State Administration of Taxation and the State Administration of Foreign Exchange
	Interim Measures for the Administration of Startup Investment Enterprises	Order No. 39 [2005] of the National Development and Reform Commission
	Notice of the State Administration for Industry and Commerce on Implementing the Implementation Opinions on Some Issues concerning Law Application for the Administration of Examination and Approval and Registration of Foreign-funded Companies	Order No.102 [2006] of the State Administration for Industry and Commerce
	Measures for the Administration of Registration of Partnership Businesses of the People's Republic of China	Order No. 236 [2007] of the State Council
	Notice of the Ministry of Commerce on Matters	Order No. 9 [2009] of the

	Concerning the Examination and Approval of Foreign-funded Startup Investment Enterprises and Foreign-funded Startup Investment Management Enterprises	Ministry of Commerce
	Administrative Measures for the Establishment of Partnership Enterprises within China by Foreign Enterprises or Individuals	Order No. 567 [2010] of the State Council
Fund Investment	*Notice of the Ministry of Commerce on Decentralizing the Examination and Approval Power for Foreign Investment*	Order No.209 [2010] of the Ministry of Commerce
	Notice of the Ministry of Commerce on Foreign Investment Management	Order No.72 [2011] of the Ministry of Commerce
	Catalogue of Industries for Guiding Foreign Investment (2011 Revision)	Order No. 12 [2011] of the National Development and Reform Commission and the Ministry of Commerce
Fund Exit	*Provisional Regulations on the Establishment of Foreign-Funded Joint Stock Companies Limited*	Order No. 1 [1995] of the Ministry of Foreign Trade and Economic Cooperation
	Notice of the Ministry of Finance, the State-owned Assets Supervision and Administration Commission, the China Securities Regulatory Commission and the National Council for Social Security Fund on Exempting State-owned Venture Investment Institutions and State-owned Venture Investment Guidance Funds from the State-owned Share Transfer Obligation	Order No.278 [2010] of the Ministry of Finance, the State-owned Assets Supervision and Administration Commission, the China Securities Regulatory Commission and the National Council for Social Security Fund
	Circular on Releasing the Listing Rules of Shenzhen Stock Exchange (Revised in 2012)	Order No.214 [2012] of the Shenzhen Stock Exchange
	Circular on Promulgating the Listing Rules of Shanghai Stock Exchange (Revised in 2012)	Order No.34 [2012] of the Shanghai Stock Exchange
	Interim Measures for the Administration of National SME Share Transfer System Co., Ltd	Order No. 89 [2013] of the China Securities Regulatory Commission
Taxation	*Notice of the Ministry of Finance and State Administration of Taxation on the Relevant Tax Policies on the Development of Startup Investment Enterprises*	Order No. 031 [2007] of the Ministry of Finance
	Notice of the Ministry of Finance and the State Administration of Taxation on Several Issues Concerning the Enterprise Income Tax Treatment on Enterprise Reorganization	Order No.59 [2009] of the Ministry of Finance
	Notice of the State Administration of Taxation on Income Tax Preferences for Startup Investment Enterprises	Order No.87 [2009] of the State Administration of Taxation
	Notice of the State Administration of Taxation on Some Tax Issues Concerning the Implementation of the Enterprise Income Tax Law	Order No.79 [2010] of the State Administration of Taxation
	Circular on Printing and Distributing the Interim Measures for the Collection of the Equity Investment Income of Venture Capital Guidance Fund for Small and Medium-Sized High-Tech Enterprises	Order No. 361 [2010] of the Ministry of Finance
	Notice of the Ministry of Finance and the State Administration of Taxation on Policies for the Pilot Project of Enterprise Income Tax for Corporate Partners of Limited Partnership Venture Capital Investment Enterprises in Suzhou Industrial Park	Order No.67 [2012] of the Ministry of Finance and the State Administration of Taxation
Supervision	*Circular of the General Office of the National Development and Reform Commission on*	Order No. 2864 [2011] of the National Development

	Promoting the Standardized Development of Equity Investment Enterprises	and Reform Commission
	Law of The People's Republic of China on Securities Investment Fund	Order No. 71 [2012] of the President
	Notice of the General Office of the National Development and Reform Commission on Further Regulating the Development and Filing Management of Equity Investment Enterprises in Pilot Areas	Order No.253 [2011] of the General Office of the National Development and Reform Commission
	Circular of the Ministry of Commerce on Improving the Regulation of the Record-filing of Foreign-invested Venture Capital Enterprises	Order No.269 [2012] of the Ministry of Commerce

Source: Laws and Regulations of VC/PE Funds in China 2013, by China Venture Capital and Private Equity Association.

2.2.2 PE investors in China

From a theoretical perspective, PE investors can be divided into three categories: independent PE fund firms, captive PE fund firms and semi-captive PE firms (EVCA, 2007; Leleux and Surlemont, 2003). The independent PE firms are defined as investors who use third parties as the main source of capital, including governments, large corporations, wealthy individuals, pension funds and banks. For example, the Texas Pacific Group, Bain Capital and Kohlberg Kravis Roberts are independent PE firms. The captive PE firms raise funds and capital from their primary shareholders (including insurance companies, investment banks, financial institutions and industry companies) and/or a parent company. The parent organization allocates money to the fund from its own internal sources. These funds are supposed to be invested into sectors relevant to their core activities and to identify technologies for new business. Some of the representative captive PE firms include Hony Capital under Legend Capital Ltd, Morgan Stanley Capital Partners and Goldman Sachs Group Principal investment Asia. Semi-captive PE firms combine the previous two types of PE firms and raise capital from both outside investors and their parent companies. The semi-captive PE firms can be subsidiaries of a financial institution, an insurance company or an industrial company that operates as an independent company. EQT is an example of a semi-captive private equity firm, which raises capital from its primary shareholder, the Wallenberg family, as well as from other external investors (EVCA, 2007; Leleux and Surlemont, 2003).

In the Chinese case, we realize that it can be difficult to categorize PE investors following the above definitions due to the different background of PE investors. After referring to

several different Chinese sources (Licai, 2012; Noah, 2010) and adapting some characters of the Chinese PE market, we divide Chinese PE investors into the following three categories: (1) Government affiliated PE firms, i.e., firms set up by government agencies, such as Shenzhen Capital Group Co.Ltd.. (2) Financial institutions-affiliated PE firms, i.e., firms set up by securities companies and large banks, such as GoldStone Investment Co., Ltd. under CITIC Securities Co. Ltd., and GF Xinde Investment Management Co., Ltd. under GF Securities, BOC (Bank of China International) International and CCB (China Construction Bank) International. (3) The rest of the domestic PE firms includes firms with university background, for example Tsinghua University Education Foundation; and firms set up by large listed corporations, for example Hony Capital Ltd held by the Legend Group.

- Government-affiliated PE firms

Government-affiliated PE firms are firms with Central government and/or local government background (EVCA, 2011). The first domestic PE firm, China New Technology Startup Investment Company (Zhongchuang or Chinavest), was set up by central government in 1985 with a venture capital orientation and focus on high-tech firms. Chinavest was under the supervision of both National Science and Technology Commission (holding 40% of shares) and the Ministry of Finance (holding 23% of shares). Later, Chinavest, together with Standard Chartered Bank (HongKong) and Asian Development Bank, set up a joint firm called China Asset Holding Ltd. In 1991, China Asset Holding became the first overseas domestic venture capital company listed on the Hong Kong Stock Board. Even though Chinavest did not perform well during the Asian

Crises and finally went bankrupt in 1997. The establishment of Chinavest set up a milestone for government-supported venture activities.

Not only did central government set up PE firms, such as: National Council for Social Security Fund, SDIC Innovation (Beijing) Investment Fund Management Co. Ltd., but also local governments have set up their own government-backed VC/PE firms to support local SMEs and high-tech firms. These VC/PE-backed are mostly concentrated in the coastal and southeast developed regions. Some of the famous VC/PE firm includes: Hefei Hi-Tech Venture Capital Co., Ltd., Shenzhen Capital Group Co., Ltd., Shandong High-Tech Investment Corp., Guangdong Technology Venture Capital Co. Ltd., Shenzhen Capital Group Co., Ltd., to name a few. These local government-backed VC/PE firms mainly focus on the dynamic growth companies in their own provinces, only exceptional investment opportunities in other regions will be considered. Compared to other VC/PE investors, the government-backed VC/PE firms have more stable funding sources and technology support. As a result, these PE investors have preference in high tech firms and their funding amounts are normally within a set scope. For example, Guangdong Technology Venture Capital Co. Ltd has set its first round investment between RMB 10 million and RMB 20 million. In addition, the tight connection with government can help to provide more investment opportunities, especially in monopoly industries. The downside of receiving this type of PE funds is that the investors normally demand priority rights over other investors (BVCA, 2011). For example, the PE investors require receiving distributions ahead of other investors and even rank their claim above other investors at the time of liquidation (BVCA, 2011).

- Financial institution-affiliated PE firms

Chinese brokers have made their first move into the PE industry since 1990 by making direct VC/PE investment. These investors include some of the biggest securities firms at that time, like *NanFang* Securities and *Dapeng* Securities. However, due to the large amount of non-performing assets in these securities firms and a lack of exit routes, most of their VC/PE investments ended up with heavy losses. The China Securities Regulatory Commission (CSRC) hence prohibited securities firms to make VC/PE investments. This prohibition was valid until 2006, when the State Council authorized securities firms to carry out venture capital and private equity business using self-owned capital to make direct investments. Under this restriction, securities firms either make investment through a non-fully controlled PE firm or invest in its own direct investment subsidiary firm with 100 percent ownership control (Licai, 2012). Further, in July 2011, CSRC issued *Guidelines on Supervision and Administration of Direct Investment Business of Securities Companies*. This new guideline restates CSRC's specific requirements from different perspectives, including business scope, and risk control for brokers. More importantly, the new regulation allowed brokers to set up direct investment companies and fundraising from third party investors. The Guidelines also broke the limitation by stating that any brokers' direct investments should not exceed 10% of their total assets and allowed the transform of securities-backed PE firms into professional PE fund management institutions. Following the new guidelines, big securities have set up their own direct investment subsidiaries. For example, Goldstone Investment under CITIC Securities, Haitong Capital under Haitong Securities and Guosen H&S investment company under Guosen Securities. The investment scale of these direct investment subsidiaries are

largely affected by the net capital of their parent companies.

In recent years, some of the large State-owned banks have also set up their own direct PE investment firms, such as BOC (Bank of China International), CCB (China Construction Bank) International and ICBC (Industrial and Commercial Bank of China) International. In September 2010, Chinese insurance companies were granted permission to invest up to $33bn into the local private equity market (BVCA, 2011), which is another important step to the expansion of the PE market.

Compared to other PE domestic investors, the financial institution-affiliated PE investors can make the best use of their financing advantages and the research resources from their parent financial institutions, i.e., securities firms and banks. For example, the securities-backed PE firms can benefit from their parent companies' own research teams and accumulated market experience in making direct investment. Moreover, when the securities firms are working with other firms, they have the advantage of screening high potential growth firms and passing on such investment opportunities to their investment subsidiaries, which help to improve the efficiency of PE investment. The establishment of an independent firm can also separate risk from parent company to the subsidiary. The separation plays a positive role in convincing LPs regarding the independence of the PE firm as well.

- Other domestic PE firms

Apart from the above mentions two types of PE investors, there are some other featured

domestic PE firms in the Chinese market.

The first type is university–backed PE firms, which is normally set up by a university spin-out and a VC/PE firms. The university spin-out is normally an idea or concept raised by a university and then transformed into a practical product to the market, especially in the area of biotechnology, life sciences and high-tech products (BVCA, 2011). Universities usually devote resources through external partnerships, particularly with VC/PE investors (BVCA, 2011). The type of collaborations started in China since 2000. This type of university-backed PE firms can take the advantages from both academics and VC funding sources. For example, these PE investors have the advantages in accessing and capturing first-hand information on certain research projects undertaken by the university and discovering the potential portfolio firms (BVCA, 2011). One outstanding example comes from Tsinghua University, where two spin-out venture capital firms are in operation: the TusPark Capital Co., Ltd. (TusPark Ventures) and the Shenzhen Tsinghua Leaguer Venture Capital Co., Ltd. Both firms focus on Bio-Tech, Clean-Tech and other green technology sectors. Following the success of Tsinghua University, Zhejiang University has also set up a subsidiary company, Zhejiang University Venture Capital Co., Ltd. The advantage of these types of PE investors is to integrate the resource of top universities, research institutes, enterprises, talents, capital and information and help to accelerate the growth of high-tech enterprises.

The second type is the corporate PE funds. Some of the large domestic firms have set up their own PE subsidiaries under the trend of the booming PE market. These affiliated PE

firms normally make investment outside their parent firm's sectors, which is regarded as a type of risk-sharing strategy. For example, Hony Capital, sponsored by leading PC company Legend Holding, focuses on sectors such as pharmaceuticals and healthcare, media and entertainment, financial services, construction materials etc. Some of the other pioneer corporation-backed PE firms include: Xiamen Torch Venture Capital Co., Ltd under Xiamen Torch Group Ltd.; and Fosun Venture Capital under Shanghai Fosun Group.

- Overseas PE firms

As discussed previously, the entry of overseas PE investors to the Chinese markets began in early 2000. Compare to domestic investors, foreign investors are more capable in transforming their experience into value-added services to portfolio firms based on their much longer experience in managing PE funds. While the global economy is still recovering, China remains one of the most compelling growth stories and overseas investors continue to be attracted by China's fast developing PE market. For example, until 2010, the Chinese market took up 10% of TPG's total investment and annual revenue[20]. In the same year, China became the second largest market for TPG. The other major overseas PE investors in China were Blackstone, KKR, Carlyle, Bain Capital and Goldman Sachs PIA, etc.

A summary of PE investors on China by different types can be found in Appendix 2.3.

[20] Information available from: http://www.iceo.com.cn/renwu/35/2010/0925/200670.shtml

2.3 An overview of the Chinese PE market

The Chinese PE market has a history of over three decades and has made its major development since 2000. After years of development, total investment value in China has increased from $7 billion in 2009 to $20 billion in 2011, ranking third behind the $112 billion and $30 billion investment values of US and UK businesses respectively (Table 2.3). Compared to other developed countries, China has a much higher ratio of new funds raised to total investment value, indicating an increased interest and confidence in the Chinese market. According to Thomson Reuters' report, China-focused funds have grown from 1% in 2007 to more than 9% of the global funds raised in 2009 (see 'Global private-equity firms are seduced by the China dream', *The Economist*). A report from Adveq has also indicated that China received over 80% of Asian private equity investment volume in 2009[21]. Although there was a 46% decline ($11.4 billion) in PE deals across Asia Pacific (excluding Japan) in 2013, Chinese firms have taken up 39% of the market share, followed by India with 27% of market share (see 'Private equity in China: heating up, but veiled in uncertainty', *Wharton Business School online business journal*). Despite the high market ratio, the operation of firms and the financial market in China are different from those of mature market economies. In this section, we will introduce the features of Chinese PE market which can help to understand the operation of PE investment in the following empirical analysis.

[21] Adveq is a leading independent global private equity investment management firm.

Table 2.3 Private equity investment/funds raised by country

	2009		2010		2011	
	Investment value ($bn)	New funds raised	Investment value ($bn)	New funds raised	Investment value ($bn)	New funds raised
US	51	88	119	152	112	146
UK	20	5	26	12	30	23
China	7	7	15	32	20	29
France	5	3	9	6	13	8
Australia	1	1	8	6	N/A	N/A
India	3	4	7	2	10	2
Germany	3	1	6	2	6	4
Japan	3	2	2	2	N/A	N/A
Others	17	31	79	69	58	56
Total	110	142	261	275	246	268

Data source: TheCityUK estimates

2.3.1 An overview of PE practice in China

In order to present the features and the development of the Chinese PE market, we collect all of the PE-backed firms that are listed[22] on mainland stock markets before the end of 2011. Our data comes from two sources: Asian Venture Capital Journal dataset (AVCJ) and China Securities Market and Accounting Research dataset (CSMAR). The data selection follows three criteria. Firstly, we exclude two PE cases which took place before 2000 to avoid heteroscedasticity problems caused by outliers. We then identify 476 PE-backed listed firms from the AVCJ dataset by the end of 2011, excluding a group of 25 PE-backed listed financial firms. We map the necessary financial information for these sample firms from the CSMAR dataset. In the mapping step, firms without available accounting information at the time of PE investment[23] are eliminated from the dataset. Following the above procedures, a sample of 364 PE investments from 307 PE-backed firms is listed on the Chinese mainland stock markets by the end of 2011. This sample covers PE-backed portfolio firms from 2000-2011.

In this section, we report the firms' characteristics in Table 2.4, including yearly PE investment amounts from 1994-2011, PE investment by different stock exchanges, by different PE types and by different industries. The aim is to introduce the development of PE industry in China from different angles.

[22] We focus only on listed firms in this study because we can get enough firm information from these listed firms.
[23] Firms willing to be listed on the Chinese stock markets are required to provide financial information for the past three years. Some of our sample portfolio firms received PE investments before IPO. If the PE investment was made up to three years before IPO, we can still find available accounting information from the CSMAR dataset. If this cannot be done, we exclude the firm from our sample.

Panel 1 reports the number of investments and the value of investments on a yearly basis. There are 467 PE deals found in mainland listed firms[24] and these investments are worth 204.05 billion RMB in total.

We observe a small amount of PE investment before 2000 and from 2000 onwards, PE investment in Chinese firms kept an increasing trend and peaked in 2007. There were 107 PE investment deals in 2007 worth 12.94 billion RMB. During and after the financial crisis, there was a sharp decrease in the number of deals but an increase in PE investment volume. In 2010, PE investment reached a maximum volume of 62.29 billion RMB with only 41 deals and in 2011 with 10 deals worth 51.44 billion RMB. In sum, this table indicates the growing interest in PE investment in China over the past decade.

[24] These PE investments took place either before or after IPO. If the PE investment was made before IPO, then the investment happened within three years before IPO in which the transaction records were published during the IPO application process.

Table 2.4 Summary of PE investments in mainland listed firms, 1994-2011.

Panel 1. Summary of PE investment by year.

	No. of deals	% of PE deals	Value of PE investment (bn RMB)	% of PE investment
1994	2	0.43	0.03	0.01
1995	1	0.21	0.05	0.02
1996	2	0.43	0.07	0.03
1997	0	0.00	0	0.00
1998	1	0.21	n/a	0.00
1999	3	0.64	0.03	0.01
2000	13	2.78	0.51	0.25
2001	24	5.14	2.02	0.99
2002	11	2.36	0.32	0.16
2003	12	2.57	0.62	0.30
2004	25	5.35	14.69	7.20
2005	16	3.43	2.58	1.26
2006	40	8.57	8.62	4.22
2007	107	22.91	12.94	6.34
2008	76	16.27	5.54	2.72
2009	83	17.77	42.3	20.73
2010	41	8.78	62.29	30.53
2011	10	2.14	51.44	25.21
Total	467		204.05	

Data source: (1) *China Stock Market Financial Statements Databases*

(2) *Asian Venture Capital Journal Dataset (AVCJ)*

In Panel 2, we summarize our PE-backed firms by their listing stock boards. There are two stock exchanges in China, namely, Shanghai Stock Exchange and Shenzhen Stock Exchange. Apart from the two main stock boards in each stock exchange, two new stock boards have been established recently in Shenzhen Stock Exchange. The Small and Medium Enterprises (SME) board was established in 2005 followed by the ChiNext board in 2009. The initial purpose of establishing these new boards was to provide financing for SMEs and to encourage the development of high-tech industry. After their establishment, firms listed on SME board and ChiNext board received the majority mount of the PE-backed IPO firms. As shown in Panel II, SME board and ChiNext board has received 214 and 145 deals respectively, which took up 45.82% and 31.04% of the total investments. When comparing the number of PE investment in different stock boards, we observe that new boards contain a larger size of PE-backed firms but each firm has a smaller amount of PE. On the contrary, although the Shanghai Stock Exchange has a smaller number of listed PE backed firms, the volume of each deal is large. As a result, Shanghai Stock Exchange retains a total amount of PE investment worth 177.03 billion RMB compared to the 27.02 billion RMB investment made in the Shenzhen Stock Exchange. This observation is consistent with the nature of firms listed on different stock boards, i.e., mature firms are listed on main boards while young and high-tech SMEs go public on new boards.

Panel 2. Summary of PE investment by stock exchange

	1994-2006	2007	2008	2009	2010	2011	Number of PE deals	% of the total PE deals	Size of PE investment	% of the total PE investment
SZSE[a]	11	4	1	0	3	2	21	4.49	7.5	3.67
SME[b]	88	61	28	22	13	2	214	45.82	13.51	6.62
ChiNext[c]	17	32	38	45	12	1	145	31.04	6.01	2.94
SHSE[d]	34	10	9	16	13	5	87	18.63	177.03	86.76
Total	150	107	76	83	41	10	467		204.05	

[a, b, c, d] represents Shenzhen Stock Exchange main board, Shenzhen Stock Exchange Small and Medium Enterprises board, Shenzhen Stock Exchange Growth Enterprises board and Shanghai Stock Exchange mainboard respectively

Data source: (1) *China Stock Market Financial Statements Databases*

(2) *Asian Venture Capital Journal Dataset (AVCJ)*

One distinct difference between the Chinese PE market and mature PE markets is the stage of PE investment and PE types. To illustrate such difference, panel 3 illustrates PE deals by their types. In this table, we find 305 out of the total 467 deals are Growth Capital, 51 of them are PE PIPE deals and 73 Pre-IPO deals. Only 4 of them are buyout-backed firms and 30 Start-up backed firms. This reveals the features of the Chinese PE market that the majority of the PE types are located between VC and buyout, which can be regarded as late stage VC investment. This table also shows the potential possibility that Chinese PE investment is operating differently from existing literature. Although the amount of Pre-IPO type is small, most of the growth capital defines their role as Pre-IPO to capture the high IPO market returns which will be discussed in the following sections. Our evidence is consistent with EVCA (2011) report. In the report, it is stated that 'a striking difference between the Chinese market and more mature PE/VC arenas is that private equity is almost synonymous with growth capital in China.

Panel 3. Summary of PE investment by PE investment type

	Number of PE deals	% of the total PE deals	Size of PE investment (bn RMB)	% of total PE investment
Buyouts	8	1.713	2.17	1.063
Pre-IPO	73	15.632	59.54	29.179
Start-up	30	6.424	1.19	0.583
PIPEs	51	10.921	124.43	60.98
Growth Capital	305	65.310	16.72	8.194
Summary	467		204.05	

Data source: Asian Venture Capital Journal Dataset (AVCJ)

We are also interested in whether domestic and non-domestic PE investors have different investment behaviour and preference in the Chinese market. Therefore, we present our PE sample by their investors' country of origin in Panel 4. The results indicate that most of the sample PE investments were made by Chinese domestic investors, which is 386 out of the total 467 transactions. For the rest of the transactions made by non-domestic investors, 25 of them came from Hong Kong, 18 PE funds came from Singapore, 19 PE funds came from the US, 3 PE funds came from Germany and Switzerland respectively and 2 came from Canada. Also, there are 11 deals with undisclosed investors. Comparing investments made by domestic and non-domestic investors, it turns out that, although Chinese domestic investors account for the largest proportion of investments, each deal size is relatively small: the 386 investments made by domestic investors is worth 80.18 billion RMB while non-domestic investors contribute 123.87 billion RMB from 81 deals.

Panel 4. Summary of PE investment by investor's country of origin

Country of origin	Number of PE deals	% of the total PE deals	Size of PE investment (bn RMB)	% of total PE investment
China	386	82.65	80.18	39.29
HongKong	25	5.35	8.38	4.11
Singapore	18	3.85	107.83	52.84
US	19	4.06	6.16	3.02
Germany	3	0.64	0.32	0.16
Switzerland	3	0.64	0.16	0.08
Canada	2	0.43	0.03	0.01
Undisclosed Investor(s)	11	2.35	0.99	0.48
Summary	467		204.05	

Data source: *Asian Venture Capital Journal Dataset (AVCJ)*

To provide further evidence on the investment differences between domestic and non-domestic investors, we summarize the firm information of both domestic and non-domestic PE investors. Due to the information availability from the AVCJ database, we can report PE firm age and previous experience information for 131 domestic PE investors and 24 non-domestic PE investors, reported in Panel 5. By comparing the two types of PE investors, we notice domestic investors are younger (with average age of 6.06 years at the time of PE investment) than non-domestic investors (with average age of 12 years at the time of PE investment). Regarding the experience of previous PE investment, domestic investors have made an average of 10.6 PE deals, far fewer than the 21.11 average PE deals made by non-domestic PE investors. Although our sample size is small, we can still say this sample unveils some characteristics of PE investors in China, i.e., Chinese domestic PE investors are young and lack past experience compared to their non-domestic competitors. At the end of the table, we also report the PE deal stake information between domestic and non-domestic investors. It shows that, even though the investments undertake by domestic investors are worth six times as much as non-domestic investors, the PE deal stake held by domestic investors are smaller on average (on average 9.52% for domestic investors and 15.68% for non-domestic investors). There are several reasons that can help to explain why the PE investors become minority shareholders [25] (Cao et al., 2014). PE investors may decide to undertake the position of minority shareholder because they do not have strong incentives to be more influential in the portfolio firm or because of cost saving considerations; PE investors may also undertake the minority shareholder

[25] The statement that PE investors normally become minority shareholders is also found in several non-academic reports and world-leading news outlets. Including *the Private Equity Review* by Radke (2012), *China Private Equity Chilled by 'Old Days' Asking Prices* from Bloomberg (2013).

position as a strategy to reduce their risk, for example, because they lack experience in the corresponding industries; the role of minority shareholder may represent a way of diversifying PE investors' investments. Alternatively, we regard the limited shareholding passed on the PE investors as a self-protection mechanism for most Chinese portfolio firms, which we will explain in detail in Chapter 3. The minority shareholder position in portfolio firms is resulted from the concentration on growth capital PE type and PE investors are therefore less influenced on the strategic direction of business in portfolio firms (BVCA, 2011).

Panel 5. Summary of PE investor characteristics by investor's country of origin

	Mean	Medium	Min	Max	Obs
PE age					
Domestic	6.06	6	1	26	131
Non-domestic	12	5.5	1	45	27
Summary	7.03	6	1	45	
Previous experience					
Domestic	10.6	3	0	134	131
Non-domestic	21.11	11.5	0	78	27
Summary	12.53	4.5	0	134	158
PE deal stake (%)					
Domestic	9.52	7.25	0.34	100	290
Non-domestic	15.68	10	0.12	100	55
Summary	10.50	7.41	0.12	100	345

Data source: *Asian Venture Capital Journal Dataset (AVCJ)*

Lastly, we are also interested in the industries that PE investors are preferred. Following *the Guidelines for Classification of Listed Companies* issued by the China Securities Regulatory Commission (CSRC), we summarize the CSRC two-digit industry classification of PE investment during the sample period, shown in Panel 6. The table shows that manufacturing industry received the majority of PE investment, with 345 deals worth 48.23 billion RMB. This is followed by the information transmission, software and information technology service industry, with 30 deals worth 1.36 billion RMB. Despite the small number of investments in the financial industry, the total 24 deals are worth 113.55 billion RMB. We also observe that PE investments have targeted all the industries in China apart from hotel and catering industry and education industry. China's competitive strength is in manufacturing and PE investment is concentrated in this sector, explaining the development potential in this sector.

Panel 6. Summary of PE investment by investee industry

	CSRC industry classification	Number of PE deals	% of total PE deals	Amount of PE investments (bn RMB)	% of total PE investment
A	Agriculture, forestry, livestock farming, fishing	7	1.50	0.17	0.08
B	Mining	9	1.93	4.06	1.99
C	Manufacturing	345	73.88	48.23	23.64
D	Comprehensive	1	0.21	0.16	0.08
E	Construction	9	1.93	0.32	0.16
F	Wholesale and retail	15	3.21	33.48	16.41
G	Transportation	6	1.28	0.97	0.48
H	hotel and Catering industry	0	0.00	0	0.00
I	Information transmission, software and information technology service	30	6.42	1.26	0.62
J	Finance	24	5.14	113.55	55.65
K	Real estate	4	0.86	0.97	0.48
L	Leasing and commerce service	2	0.43	0.08	0.04
M	scientific research and technology service	2	0.43	0.05	0.02
N	water conservancy, environment and Public facilities management	8	1.71	0.29	0.14
O	Utilities	1	0.21	0.24	0.12
P	Education	0	0.00	0	0.00
Q	Health and social work	1	0.21	0.02	0.01
R	Culture, sports and entertainment	3	0.64	0.20	0.10
	Total	467		204.05	

Data source: (1) *China Stock Market Financial Statements Databases*

(2) *Asian Venture Capital Journal Dataset (AVCJ)*

(3) *CSRC industry classification*

2.4 A comparison between Chinese PE market and the West

In this section, we provide an analysis of the differences between the Chinese PE market and other mature PE markets. PE investment in China varies in several ways such as PE size, PE type and PE investors' ownership control.

The biggest difference between the Chinese market and mature PE markets is in PE types. The buyout PE type which is commonly found in mature markets is rare in China (shown in Panel 3, Table 2.4). PE investment is almost synonymous with Pre-IPO and growth capital in China (BVCA, 2011; also see Panel 3, Table 2.4). Both PE types focus on providing capital for companies that are already established and to fulfill the growth potential of these firms (BVCA, 2011). In particular, most of the investments target firms with listing potential, aiming for higher exit returns (to be discussed in Chapter 4). The lack of buyout investment also results in a low leverage ratio.

A consequence of focusing on pre-IPO and growth capital in China is that PE investors normally take a minority stake and have less control over their portfolio firms. This observation is in sharp contrast to PE transactions in mature markets, especially in the form of buyout, where PE investors perform as the majority shareholder and play an active role in managing the portfolio firms. As a result, rather than implementing significant strategic changes, the value-added activities provided by PE investors to Chinese portfolio firms are mostly attributed to IPO preparation (BVCA, 2011; Zhang and Li, 2012). The monitoring role of PE investors is hampered in Chinese firms where a disproportionate ownership structure is found (Cao et al., 2014).

Regarding the selection criteria of PE target firms, western PE firms normally pick their portfolio firms based the firm's business plan (Bruton and Ahlstrom, 2003). On the contrary, due to the existence of high asymmetric information, a firm's business plan does not provide enough information for Chinese investors. PE investors in China typically collect and analyze information from various other sources before an investment decision is made (Pukthuanthong and Walker, 2007). Due to the weak legal protection for minority shareholders in China, PE investors try to reduce their investment risk by selecting companies based on a good track record of profitability. Unlike in the US, where most PE investments focus on high-tech industries such as communications and computer-related industries (Gompers, 1995), PE investors make most of their investment in traditional industrious such as manufacturing (see Panel 6 Table 2.4) and locate their offices in Beijing, Shanghai, or Shenzhen (China Venture Capital Research Institute's report, 2008).

Another key difference between domestic and non-domestic investors is their different investment behaviour. Among our sample firms, it is observed that overseas investors tend to focus more on creating a small number of large PE deals which is in sharp contrast to the large number of small deals made by domestic PE investors (Table 2.4, Panel IV). In contrast, domestic investors are more interested in generating short-term benefits. This distinct difference can be observed from the ratio of PE-backed IPOs in both types of PE investors, almost 90% of the PE-backed IPOs are from domestic investors.

To sum up, the above analysis of the characteristics of the Chinese PE market implies that PE investment in China may have different investment motivation as well as different

impact on portfolio firms. In the following empirical chapters, we will address such differences in detail.

Chapter 3 Theoretical Framework

Along with the dramatic development of PE industry after the 1990s (Fenn et al., 1998), a number of studies have examined how portfolio firm performance has been improved after PE investment (Kaplan, 1989; Gompers and Lerner, 2000; Davila et al., 2003; Guo et al., 2011; Bruton et al, 2010). The performance improvement has been attributed to the following reasons: PE investors' reputation factors (Demeroglu and James, 2010), the level of PE evolvement (Florin, 2005) and PE inflow on R&D (Brown and Floros, 2011). Other explanations include the improvement of corporate governance, which refers to the explanations such as more concentrated boards (Gertner and Kaplan, 1996), better strategic leadership, more focus on value creation activities (Rogers et al., 2002) and steadfastly resistance on managerial disciplines (Acharya et al., 2008). Different theories have been addressed to explain how PE affects firm performance. However, there are few theoretical frameworks that explain how PE works in emerging markets, such as China. As discussed in the previous chapter, the Chinese PE market is different from mature markets in a lot of ways and therefore it is not wise to explain the Chinese PE market by applying western theories directly. In this chapter, classic theories in explaining PE investments will be illustrated. By including PE practice in China, we will propose different hypotheses for testing in the following three empirical chapters.

To tackle the theoretical foundation for PE investment, five theories will be mentioned: the neoclassical theory, the financing for investment and growth theory, the asymmetric information theory, the agency theory and the institutional theory.

The neoclassical theory provides a foundation for economic activities based on the notion of rational, fully informed and wealth-maximizing individuals (Weintraub, 1993). From demand side it explains capital claim, which complements the demand of capital PE portfolio firms and the purpose comes from financing for investment and growth. However, in reality, the strong efficient market assumptions can be violated. To start with the asymmetric information theory, which weakens the market transparency hypothesis by stating the incomplete information about the target firm. Additionally, the neoclassical theory does not explain how conflicts of interest between the firm's various parties – the shareholders, managers – are solved, or, more importantly, how profit-maximization goal can be achieved. Agency theory states the separation of ownership fails to engage profit maximizing between shareholders and managers. The emergence of private equity investment, has presented a positive role in solving the agency problems by associating the separated ownership and control, resulting in the realignment of managerial incentives towards the value maximization (Wright et al., 2009). Lastly, institutional theory has never ceased to raise the critical arguments on the rational action of investors (Tolbert and Zucker, 1999). Institutional theory suggests that there exist differences on the operation of PE investment around the world. It is necessary to take institutional factors into account when discussing PE investment in China (Bruton and Ahlstrom, 2003).

3.1 Neoclassical theory for PE investment

According to Weintraub (1993), neoclassical economics is called a metatheory, meaning that it is a set of principles that form the basis of economic theories. Neoclassical theory is based on three fundamental assumptions: firstly, individuals have rational references

between outcomes and values. Secondly, individuals seek to maximize utility and firms maximize profits. Thirdly, individuals act independently on the basis of full information (Weintraub, 1993). Based on these assumptions, a number of financial theories have been developed within various areas of economic activity. For example, profit maximization rests on the neoclassical theory of the firms, while the demand curve leads to an understanding of consumer goods and the supply curve examines the elements of production. Utility maximization explains the neoclassical theory of consumption, which is useful for the derivation of labor demand curves and supply curves. Another economic activity based on the assumptions of neoclassical economies indicates that the equilibrium output and prices is determined by the aggregate demand across firms and individuals (Dymond, 2015).

By applying the existing rules and theoretical concepts to PE investment, it has been noticed that the high demand of PE occurs at the time when the level of capital demand and supply are simultaneously high (Sommer, 2013). The demand side analysis embraces firms' requirement for financing, while the supply side indicates that wealthy and institutional investors chase high return investment opportunities on the one hand, and the low returns from assets like stocks and bonds stimulate the booming of PE market on the other hand. However, we do not expand the supply side explanations because the supply side information mainly comes from PE investors which is not the main focus of this thesis.

3.1.1 Capital demand

The theory of capital market imperfection indicates that a lack of external financing sources is the biggest problem for most non-financial firms (Greenwald et al., 1984; Fazzari et al., 1988). As firms grow, their desire for financing tends to increase. There comes a point at which reliance on internal financing will restrict a firm's growth and external financing is required to accelerate it.

From capital demand side, the requirement of capital arises when positive NPV projects are available. A growing economy provides more attractive investment opportunities for firms leading to requirements for more capital to finance business establishment and expansion (Sommer, 2013). However, growth opportunities have been indicated to put firms under risk. The higher potential risk may also bring higher uncertainty to firms' future cash flow. As indicated by Greenwald et al (1984) and Fazzari et al (1988), a lack of external financing sources is the biggest problem for most non-financial firms. In addition, Myers (1977) argues that firms with potential high growth rate prefer equity over debt because they fear passing on control rights from shareholders to debt holders. Also, growth opportunities have been indicated to induce moral hazard problems and put firms under risk (Anderson et al., 2016). The higher potential risk also brings higher uncertainty to firms' future cash flow. In order to mitigate this problem, firms with excess growth opportunities should be financed by equity instead of debt as a buffer against possible financial constraints arising from debt financing. Taken together, gaining access to a source of financing alternative to traditional external financing channels such as bank loans and equity financing is probably the most fundamental reason for demanding PE

investment.

The emergence of a hot PE market is normally accompanied by a liquid debt market and the availability of cheap credit (Acharya et al., 2007; Axelson et al., 2009). According to Acharya et al (2007), the global booming PE market from 2003 to 2007 contributes to the abundant liquidity in the credit market and the unparalleled leverage supply, especially the enormous government surpluses from Asia as well as pension funds and private wealth. According to the model introduced by Axelson et al (2009), the cheap debt financing and the availability of excess capital provides the conditions for PE financing.

3.1.2 The application of capital demand in the Chinese market

In the Chinese case, due to the strict capital controls and limited domestic investment options, for domestic firms, especially the SMEs, the demand for getting external financing channel turns out to be the fundamental reason for receiving PE investment (Bo et al., 2011). Bank loans, equity issue in the stock market and bond issue are the most commonly used external channels. Subject to political influences and monetary policy restrictions, banks in China have high sovereign ownership and make their lending decisions based on credit records. In China, bank loans are the major financing source for Chinese SMEs of which 66.7% of them rely on loans from banks, according to a survey conducted by Ba (2013). In the same report, the author indicates that more than 1/3 of the SMEs have problems getting loans from banks due to the absence of sufficient collateral in which banks make their lending decisions based on credit records. According to the

report, Chinese SMEs highly rely on short term debts, as 61% of the enterprises report that the majority of their financial concerns are related to short-term liquidity. In addition, the Chinese stock market is unable to provide enough seats for firms to go to listing and the corporate bond market is under construction[26].

We treat the demand of alternative funding channels as an explanation for PE investment and the inflow of PE funds is meant to have a positive impact on firm performance. In China, SMEs contribute 58.5% of GDP but only use 20% of China's financial resources (Xinhua, 2012). The lack of financing is a common problem faced by SMEs because the large amount of disproportionate loans are allocated to State-owned Enterprises (SOEs) and large enterprises (Shi, 2013). SMEs normally lack finance sources due to their short operating history and the high-risk nature of their investment projects. When bank lending becomes difficult for SMEs, SMEs are obliged to switch to alternative financing channels, in which the emergence of PE investment serves the needs of those firms and helps with SMEs' future development. The emergence of PE investment also helps to solve funding difficulties by providing newly established, high growth and high-tech firms with fast funding opportunities than traditional debt financing channels.

All together, we regard the demand for capital helps to explain the receiving of PE investment for Chinese firms. For empirical testing, we use sales growth rate as our

[26] There are 1400 companies and 1050 companies listed on Shanghai stock exchange and Shenzhen stock exchange respectively, which accounts for only 0.02% of the total number of Chinese SOEs and private companies. As a result, the Chinese stock market is unable to provide enough seats for firms to go to listing. Furthermore, the corporate bond market in China is under construction. In spite of the fact that China's bond market is now the third largest in the world at about RMB 35.89 trillion (USD 4.24 trillion) by the end of 2014, only RMB 757 billion comes from corporate bonds (Goldman Sachs, 2014).

proposed testing variable (Bo et al., 2010). It is common wisdom that high growth companies require extra funding to finance their fast growth and PE investors are also more willing to support business with high growth potential (Capizzi et al., 2011). Our hypothesis is as following:

Hypothesis 1a: There is a positive relationship between firm's growth rate (sales growth) and the demand of receiving PE investment. This hypothesis will be tested in chapter 4.

3.2 Financing for investment and growth and PE investment

The fundamental reason why firms go for private equity investment is to get financing for growth and development, especially in the case where intangible assets are the core business (Capizzi et al., 2011).

The economic impact of PE investment has been widely discussed. By evaluating the performance of PE portfolio firms using different measurements, these studies can be summarized in two categories: a) comparison of performance changes before and after private equity investment (Meuleman et al., 2009; Guo et al., 2011; Bruton et al., 2010; Kaplan, 1989); b) comparison of PE portfolio firm performance with a matched sample (Wilson et al., 2012). The benefits from PE investors can be summarized as operating performance improvement, increased sales and R&D expenditure, and higher employment growth.

Kaplan (1989) indicates that buyout investment leads to operating income increases,

capital expenditure decreases and net cash flow increases in the three years after the buyout transaction by studying a sample of 76 listed buyout firms in the US. The author attributes the operating changes to the improved incentives of shareholders through inside information. Studies from both Davila et al (2003) and Alemany and Marti (2005) indicate that VC-backed firms experience significant revenue and employment growth rate increase compared to non-VC-backed firms. Especially, the engagement of VC funds leads to an increased growth rate for young start-ups. In a more recent study, Paglia and Harjoto (2014) compare post-PE and post-VC investment performance to their non-PE and non-VC peers. The authors confirm that PE investment increases portfolio firms' sales and employment growth rates in the three consecutive years after the investment. In contrast, VC financing leads to an immediately increase in sales and employment growth but the increase is not steady in the following years. In their paper, Gompers and Lerner (2000) collect over 4000 PE-backed firms from 1987 to 1995 and find that the inflows of private equity funds increase the valuation of the funds' new investment and have a substantial impact on the improvement of environment for young firms. From the success of PE-backed firms, the impact from capital inflow is the greatest among PE activities. Following their study, researchers have provided similar evidence across countries. New evidence from the US shows operating performance of VC portfolio firms is either the same or slightly higher than the benchmark firms (Guo et al., 2011). Similar evidence from the UK shows PE-backed buyout firms experienced high profitability compared to non-PE backed firms during the 2008 global recession (Wilson et al., 2012). In the recent Chinese case, Guo and Jiang (2013) find VC-backed firms performed better than the other group in terms of ROS, ROE and labour productivity by comparing 258

VC-backed firms with their non-VC-backed counterparts during the period 1998 to 2007. However, no outperformance is significant on sales growth rate and R&D investment for VC-backed firms. Nevertheless, instead of attributing the better performance to the financing role of investors, the authors explain the results by indicating that VCs can attract good firms and firms are more likely to be targeted by VCs if they show higher profitability, growth rate and labour productivity.

In this study, we regard the inflow of PE investment can largely improve firm's profitability performance. As discussed previously, PE investment has a preference of targeting pre-IPO firms in China, meaning that the PE investment is made before IPO. The inflow of PE funds should therefore has a positive impact on portfolio firm's balance sheet which leads to a higher stock board IPO passing rate (Zhang and Li, 2012). Accordingly, we set up the following hypothesis and will be examined in chapter 4:

Hypothesis 2a: There is a positive relationship between PE investment and firm's profitability performance.

3.3 Asymmetric information view for PE investment

PE investment is normally subject to the high level asymmetric information problem between PE investors and the existing management and shareholders of the portfolio firms (Sommer, 2013). On the one hand, the adverse selection problem is associated with high transaction costs and a lower ratio of successful PE deals. On the other hand,

signaling theory has proved that the adaption of PE investment can be regarded as a useful tool to unveil potential growth capabilities in PE portfolio firms.

3.3.1 Adverse selection view and PE investment

In contrast to neo-classical economics which assumes perfect information, in the financial markets, information is often observably asymmetric between firms and financiers. The theoretical literature shows that equity attracts firms with lower expected returns (lemons) while debt finance attracts firms with high variability in returns (nuts) (Cumming, 2006). PE investors confront a significant adverse selection problem associated with identifying a qualified portfolio firm to provide external finance and the investors normally spend a large amount of time on evaluating the target firm (Amit et al., 1990; Fenn et al., 1997). In general, investors are less informed than the firm owners about the true value of the firm. When information asymmetry exists, the Modigliani-Miller theory (Modigliani and Miller, 1958), which is based on the assumption of perfect capital markets, concludes that the source of financing is irrelevant to investment decisions, collapsed. Asymmetric information increases the cost of capital needed for firms to raise external financing, thus affecting future investments (Myers and Majluf, 1984). As a result, informational asymmetry adversely affects the funding channels for these firms or these firms are asked to provide more collaterals to get loans. This phenomenon is more severe for young and small firms and firms in high-tech industries, which exhibits shorter track records and lower visibility than large mature companies. The degree of asymmetric information is also likely to be higher in firms whose assets are difficult to evaluate, because they have large intangible assets but lack of assets to offer as collaterals. According to Janney and

Folta (2003), the asymmetric information in newly established and high-tech firms is due to the desire for core technology and intellectual property protection and inability to specify the 'value' of the firm in the short run. If more details are shared about their research projects, especially for high-tech firms, they have increased concern about expropriation of their research benefits and protecting their intellectual property advantage (Deeds et al., 1999). Similar studies from Gomes and Phillips (2012), Twite and Ellis (2012) have shown that firms with high asymmetric information are forced to choose private equity rather than public offering or issuing new equity. These firms are commonly under higher research and development expenses therefore have worse operating performance.

In general, PE investors hold more information about the issuing company's projects than their counterparts, i.e., the public investors (Floros and Billett, 2012). Based on their accumulated experiences in the industry and their screening methods such as due diligence reviews, PE investors can identify firms with potential growth opportunities more easily and thus leading to a lower adverse selection cost. Empirical study from Cumming (2006) has confirmed that start-ups and high-tech firms are better characterized as nuts instead of lemons.

In this thesis, our main focus is on PE portfolio firms rather than the operation of PE funds, i.e., how PE investors pick out their portfolio firms. As a result, we do not propose any hypothesis for testing in this section.

3.3.2 Signaling view and PE investment

Theory of market signaling suggests that certain variables or indicators provide information to potential investors about the capabilities of the target firms, allowing them to distinguish high-quality investment from the low-quality ones (Spence, 1973). Teece (1996) points out that signaling can help to reduce information asymmetry without divulging the source of a firm's competitive advantage. Stuart et al (1999) also indicate that firms which are able to signal their quality have a better chance of raising a higher amount of capital via IPO. Generally, it is suggested that specialized financial intermediaries like private equity funds are able to reduce some of the asymmetric information problems between entrepreneurs and external investors by signaling portfolio firm value through the PE investments. The adaptation of PE investment shows the potential growth opportunities in these portfolio firms and signals the firm's value to uninformed third parties, such as banks, suppliers and customers (Engel and Stiebale, 2009).

Signaling theory has been widely adapted in explaining PE investment. The dilemma for young firms and SMEs is that potential investors have problems in valuing the firm, which leads to undervaluation (Teece, 1996; Williamson, 1985). One possible reason for such difficult evaluation is that new firms have no performance track records and firms from new technology industry are backed with higher risks and uncertainties. External investors may also find it difficult to evaluate firms because of the information asymmetry – they cannot obtain useful information about the firm from the market or, sometimes, even from the managers. This problem is more obvious in high-tech industry firms since

the firm owners are less willing and less able to convey full information about the growth opportunities, due to their desire for core technology protection and their inability to specify the 'value' of the firm in the short run (Janney and Folta, 2003). While for PE investors, their experience of detecting high potential firms and their willingness to invest in the portfolio firms can be seen as a positive signal to the market and to other investors about the firm's future perspectives.

In academic studies, one popular method to evaluate the signaling effect of PE investment is the event study method raised by Wruck (1989). By comparing the stock market prices before and after PE announcement, the author confirms signaling through PE placements[27] has a positive impact on the valuation of firms. The stock market return after the announcement of PE placement is accompanied by a 4.5% average abnormal return, which is in contrast to the negative average abnormal returns from the announcement of a public placement. Similar stock market performance study from Janney and Folta (2003) confirms that, when private equity placement is set up, the information asymmetry in undervalued firms is found to be reduced in biotechnology firms. Moreover, by adapting private equity, these firms are able to transmit stronger signals and, in return, attract future resources more steadily.

Another indicator that is commonly used in empirical studies for signaling effect is the

[27] Many studies do not differentiate private equity investment and private placement. But in our study, we do not count private placement as private equity investment. This is because in the AVCJ dataset, it defines an investment as private equity investment only when the investment is made from a named private equity investor. As a result, we exclude private placement samples in our study. However, since the investment principal of private equity and private placement is similar, we can still borrow the commonly used event study on private placement in PE motivation testing.

R&D expenses. Because asymmetric information exists in firms with high R&D costs, firms with high R&D expenses wish to receive PE investment. Empirical finding shows that a large proportion of PE inflow capital is directed to R&D costs, especially for firms operating in high-tech sectors (Janney and Folta, 2003). As a result, the high R&D expenses can be used by portfolio firms to signal their willingness for PE investment. However, in this study, we do not regard R&D information as a good indicator for signaling effect for the following reasons: (1) R&D information can be problematic in the Chinese market. R&D information is not often reported in a firm's financial statement, as we have observed from the CSMAR dataset. Unreported R&D information, especially in high-tech firms, results from the reluctance of firm owners to risk future growth opportunities. (2) R&D information is affected by lots of other factors in China, such as *guanxi* and government support. The Chinese government has played a significant role in supporting the R&D expenses, but most of the financial support were found in SOEs (Zhang et al., 2003). Although SMEs contribute 82% of new product output and 66% of new patent registrations (Newman et al., 2015), they are characterized with much lower R&D expenditure from government support (Zhang and Xia, 2014). When a mixed sample of both SOEs and SMEs is being used, the R&D expenditure as a measurement is not very representative. (3) PE investors tend to bundle PE investment with R&D research agreement (Janney and Folta, 2003), where in China most R&D research is fully or partly supported by the government. It can be difficult for us to tell whether the increased R&D expenses come from PE investment or not. Taken together, we think the R&D index is not appropriate in examining PE motivation in this study.

As mentioned in chapter 2, one of the key characteristics of the Chinese PE market is that a large amount of the PE portfolio firms received PE investment prior to IPO. With the help of PE investors, who normally have industry experiences and some relationships with underwriters or even with CSRC, the portfolio firms have a higher passing rate for IPO listing (Zhang and Li, 2012). The approval of IPO is tightly controlled under an administrative control system run by CRSC and the approval process for issuing securities is strict and highly competitive in China[28]. Ever since the setting up of two new stock boards, which contains the majority of our sample firms, the competition has become more severe. Information from CSRC (Grant Thornton report, 2014) shows 1574 firms applied for IPO between 2006 and 2011, the actual IPO approval rate is 66.77% for application and 1051 firms are listed or to be listed. Almost half of the rejections are caused by concerns about the lack of sustainable profitability in the application firms. Guo and Jiang (2013) have indicated that the PE investment's assessment process is very selective. In order to obtain PE investment before IPO, a firm needs to signal its willingness for IPO issuing to PE investors. These firms need to present their abilities in competition with other firms during the IPO application. More importantly, the firm should try to avoid the factors that might lead to rejection, such as a bad financial performance. Ideally, we should have a proxy that represents willingness for IPO listing. Considering that such information is difficult to evaluate, we adopt alternative approach

[28] The Chinese initial public offering process is under the control of CSRC. A standard IPO procedure is as follows: firstly, the issuer completes the application documents under the direction of the underwriter, sending it to CSRC with a guarantee from two qualified sponsors. Secondly, the CSRC decides whether or not to accept the application in 5 working days after receiving the documents. Thirdly, if they accept the application documents, the relevant department will carry out a preliminary examination of the application documents after which a committee of 5-7 specialist experts arranged by CSRC takes charge of approval. Finally, CSRC presents the decision, and provides the relevant official documents. The approval of main board, SME board and ChiNext board listing is awarded by different review committees. For main board and SME board, the issuer's application documents are reviewed by Main Board public offering review committee which is composed of 25 members. While for ChiNext board, the issuer's application documents are reviewed by ChiNext public offering review committee which is composed of 35 members.

to represent the signaling effect.

Based on the discussions above, we regard the following two variables as indicators of signaling effect to PE investment. The first variable is the firm's profitability in the past 3 years before IPO. A firm with better profitability performance has the advantage in getting its IPO approved and so these firms are less motivated to signal themselves for PE investment than poor performance firms. The second variable is whether the firm is backed with state ownership. According to Saxenian (2005), the administration agency tends to favour state-backed firms. Hence, state-backed firms may have easy access to the IPO listing yet to have lower motivation for receiving PE investment. Both hypotheses will be examined in chapter 4.

Hypothesis 3a: There is a negative relationship between firm's profitability (in the past 3 years before IPO[29]) and the motivation of signaling themselves to PE investors.

Hypothesis 3b: There is a negative relationship between firm with state-background and the motivation of signaling themselves to PE investors.

3.4 Agency theory and PE investment

In their well-known book, *The Modern Corporation and Private Property*, Berle and Means (1932) started an early discussion of the consequences of the separation of

[29] The CSRC requires the financial information disclosure 3 years before the IPO application.

ownership and control for modern corporations. Because of the separation, managers have different interests and motivations from those of shareholders. The main concern of shareholders focuses on share prices and dividend pay-outs, whereas managers' concerns focus on their own power, security, organization size as well as their own wealth. Dividend payments to shareholders reduce the size of assets under managers' control and the security of managers. Therefore, the separation of ownership from control and management creates agency costs that reduce shareholder's wealth. Jensen and Meckling (1976) define an agency relationship as a contract between one or more persons (the principal(s)) and another person (the agent) to perform on behalf of their services such as decision making. They define the concept of agency costs as the monitoring of expenditure by principal, the bonding expenditure by agent and the residual loss. The authors have pointed out that the agency costs are inevitable when there is a separation of ownership and control. If both shareholders and managers are "utility maximizers", there is a good reason to believe why managers carry out projects that maximize their private benefits instead of serving the interests of shareholders. The authors conclude that only if the manager owns 100% of the firm, he will then have the intention to maximize the firm's benefits. In other words, a higher ownership concentration helps to reduce the conflict between principles and agent. Jensen (1989, 1993) indicates that there will be a relatively new organizational structure in which manager performs as an "active investor" for the publicly held corporation. In this new structure, it is more likely to solve the agency problem with emphasis on restricting corporate assets, controlling and incentivizing managers' behaviour to improve the performance and to align the interests of shareholder and management team by maximizing profit for both sides. Similar

conclusions are supported by Fox and Marcus (1992) and they show that shareholders can limit excessive managerial discretion by establishing appropriate incentives for the managers when connecting their compensation to shareholder returns. These benchmark results pave the way for the emergence of private equity.

For firms with a diluted ownership, agency conflict emergences when each owner has lower incentive to monitor the management due to the high costs of management and the low ratio of returns (Alchian and Demsetz, 1972; Jensen and Meckling, 1976). Existing studies prove that the entry of PE investors can help to reduce agency conflict by associating the separate ownership and control, resulting in the realignment of managerial incentives towards value maximization through a concentrated ownership structure (Wright et al., 2009) through the motivation of good corporate governance (Bruton et al., 2010). In a typical PE transaction, outside investors acquire shares and become shareholders of the firm during the transaction period. After setting up the transaction, PE fund managers monitor portfolio firms through their ownership of the firm. Especially in buyout transactions, PE investors typically become the largest shareholder and are responsible for management services (Gorman and Sahlman, 1989). Since fund managers are now shareholders of the firm and their compensation depends largely on fund performance, there is no reason for them to abuse managerial rights. Moreover, these experienced fund managers have better understanding on the markets. Their knowledge and network can help with value-added activities in improving firm performance. One of the key areas of interaction between private equity firms and investees is through participation on investee company boards' activities. Firstly, the board is less diverse than

before after the entry of PE investors (Gertner and Kaplan, 1996). PE shareholders have the ability to manage key shareholders, thus helping to provide a stable management and performance (Rogers et al., 2002). Secondly, PE portfolio firm boards (referred to as PE boards hereafter) provide better strategic leadership and perform more effectively in management. Compared to their public competitors, PE portfolio firms' boards monitor the firm much more actively and intensively, reviewing the progress of key initiatives in greater detail and diving more deeply into underperformance situations. PE investors have the right to condition their investment contract and they can shape firm structure by using their board right to replace a poorly performing management team (Acharya et al., 2008). Lastly, a PE manager acts as 'consultant' by transforming value added skills and bringing social network influence into the portfolio firms (Stuart and Yim, 2010). In sum, reduced agency cost problem is found from post-investment (moral hazard) performance (De Clerq and Sapienza, 2006).

The above evidence is usually found in western PE-backed buyouts firms where agency problem is between the manager and shareholders. However, the mature market based evidence may not be true in an emerging market, in which the agency problem is referred to as the principal-principal conflict (La Porta et al., 1999; Claessens et al., 2000).

Principal-principal results from the existence of a concentrated ownership structure of the firm, the absence of an effective external governance mechanism and the lack of legal mechanism protection on owners' interests (Dharwadkar et al., 2000). In such a firm structure, the majority shareholders are in a better position than the minority shareholders (La Porta et al., 1999). Although ownership concentration can lead to effective

management monitoring due to the high gains returned to the owners (Chen et al., 2009), general issues raised by the higher degree of ownership concentration lead to the problem that the majority shareholders are encouraged to pursue their own interests rather than promote value-enhancing strategic decisions at the expense of minority shareholders (Lemmon and Lins, 2003; Maury and Pajuste, 2004; Allen et al., 2005; Gompers et al., 2010; Lin et al., 2011). The problems from a concentrated ownership structure can be summarized as tunnelling and expropriation of minority shareholders by majority shareholders (Shleifer & Vishny, 1997; Morck et al., 2005; Lin and Chuang, 2011), hiring unqualified management team members who are related to the controlling shareholders (Su et al., 2008; Young et al., 2008), and less focus on firm's profitability performance (Thomsen and Pedersen, 2000). These inappropriate behaviour is observed especially in countries with less-effective minority investor protection, like SMEs in China (Nenova, 2003; Dyck and Zingales, 2004).

The features of Chinese SME firms are summarized as the existence of a concentrated ownership (Xu and Wang, 1999), restricted access to external financing (which has been discussed earlier in chapter 2) and weak institutional protection[30]. In a typical Chinese SME, ownership is tightly controlled by the founder of the firm who has absolute control with over 30% of total ownership. In some cases, the ownership controlled by the largest owner can be as high as over 60% (Qin et al., 2012). The management team members are commonly selected within the range of family members and/or close friends. Few

[30] Because the majority of our sample firms are SMEs rather than large private firms, our discussions are based on SMEs in this section.

professional managers are employed by Chinese SMEs because the SME owners think outsiders are less trustworthy. In this kind of business structure, coordination and control are highly personal and there is tight control of financial and production management (Tsang, 2001).

A number of empirical studies have taken the principal-principal conflicts into account and most of them focus on the agency conflict between different PE investors. The idea of syndication as a business alliance is to understand the strengths and weaknesses of each investor, to mitigate funding pressures, to control the risk for each firm and to evolve into more investment opportunities. The syndicated PE investors have different competitive advantages which may lead to more effective managements and value-added activities. For example, Hochberg et al (2007) indicate that VC co-investment (i.e., VC syndication) can result in principal-principal conflict of interest and objective on portfolio firm performance, such as the additional value of syndication networks to the portfolio firms. However, a number of studies hold the opposite opinion due to the enrolment of syndicated investors leading to a principal-principal conflict between different investors. Hoskisson et al (2002) refer to this type of agency cost as 'conflicting voices'. These authors suggest that the diversity of VC investors' interest and decision-making may lead to a negative impact on portfolio firms. By comparing portfolio firms in the UK and the US, Chahine et al (2012) confirm that different interests among syndicate VC investors are likely to amplify the principal-principal problem. The impact of VC syndicate diversity leads to lower reputation factors, which positively affects the earnings management but results in a negative impact on portfolio performance. The authors also

find that the syndicate diversity problem is severe in the US rather than in the UK. Moreover, the syndication may result in less concentrated ownership and thus lower the incentives of individual syndicate members. According to Cumming and Johan (2013), a potential free-riding problem may be caused by syndicated investors. In the Chinese case, both Guo and Jiang (2013) and Hua et al (2016) suggest that instead of accelerating the principal-principal conflict between different VC investors firms, the syndicated VC investors have an advantage in monitoring and providing more value-added assistance to the portfolio firms (Guo and Jiang, 2013) or the syndicated VC investors help to create value for VC-backed firms (Hua et al., 2016). Following their findings, we set up our hypothesis as follows:

Hypothesis 4a: Syndicated PE investors have significant impact portfolio firms than single PE investor.

Another agency problem in Chinese PE portfolio firms is between the majority shareholder and the PE investor. In chapter 2 we have indicated that PE investor normally becomes a minority shareholder in Chinese portfolio firms. We regard the existence of a concentrated ownership as a motivation for receiving PE investment in China for the following reasons: PE investment has a finite life and PE investors exist by selling their shares and/or floating on the IPO market (Gilligan and Wright, 2010). In addition, PE investors normally become minority rather than majority shareholders in their portfolio firms in developing countries and so play a limited monitoring role (Cao et al., 2014). Consequently, rather than weaken the dominant status of the dominant shareholders, the

PE investors exit the firm at the end of the deal period and all firm rights are returned to the owners. After studying the monitoring role of VC investors in Chinese SME firms, Cao et al (2014) conclude that the monitoring role of VC investors is exploited by the disproportionate ownership structure in the portfolio firms. But at the same time, these VC investors are compensated by lower investment cost and shorter investment duration for their investment in these newly listed portfolio firms. The above arguments suggest a positive relationship between the concentrated ownership and the motivation to receive PE investment. To further prove the above results, two concentrated ownership indicators are constructed for testing the motivation for receiving PE investment in this thesis. The first proxy variable is the Herfindahl Index (HI), which measures ownership concentration (Demsetz and Lehn, 1985; Hovey et al., 2003). The second is the proportion of shares hold by the largest shareholder. Unlike Xu and Wang (1999), who use the proportion of top 10 shareholders to represent the concentrate ownership structure, we focus only on the largest shareholder because the largest shareholder in our sample firms normally controls over 30% of the total shares and this ratio is much higher than top 2 to top 4 shareholders[31].

Hypothesis 4b: There is a positive relationship between firm's concentrated ownership and the motivation of receiving PE investment.

Hypothesis 4c: There is a positive relationship between shares controlled by the largest

[31] It is observed that the average ownership controlled by top 1 to top 4 shareholders is 31.68%, 12.12%, 5.58% and 3.38% for our sample PE-backed firms.

shareholder and the motivation of receiving PE investment.

Although firms with a concentrated ownership is more likely to receive PE investment, the minority role of PE investors suggests that PE investors are less willing or have limited role in engaging into corporate governance affairs. Thus we expect the ownership transformed to PE investors is positively related to portfolio firm's portability:

Hypothesis 4d: There is a positive relationship between ownership transformed to PE investor and portfolio firm's profitability.

3.5 Institutional theory and PE investment

In the previous sections, we have discussed how PE affects Chinese portfolio firms using different finance theories. Above all these discussions, one cannot neglect the fact that all the differences are based on the institutional background of Chinese firms, including the political structure, the legal system and economic issues. In this section, we focus on explaining how the institutional setting can play a vital role in explaining PE investment in Chinese firms.

In their early work, Davis and North (1971) defined the institutional environment as "the set of fundamental political, social and legal ground rules that establishes the basis for production, exchange and distribution. Roles governing elections, property rights, and the right of contract are examples of the type of ground rules that make up the economic environment". In different works, institutions have been stated as: a structure that helps

to coordinate political, economic and social relationship which is essential for economic development (North, 1991); institutions improve market efficiency by reducing the uncertainty from the asymmetric information among different economic players (North, 1993). In general, institutional theory emphasized on how the different beliefs, goals, and actions of individuals and groups are strongly affected by the environmental institutions they sit in (Scott, 1987).

The institutional theory has been used to explain a number of significant operation and managerial differences in different parts of the world. In the case of PE studies, institutional theory suggests that there exists differences on how PE operates around the world. In the West, it is believed that institutions have an impact on the goals and processes of PE firms (Bruton and Ahlstrom, 2003). However, little supporting evidence has been found outside the US and west European PE markets so far. For example, prior research has shown many similarities in institutional settings between the US and European PE industries (Sapienza et al., 1996). By comparing VC and angel investor performance between the UK and France PE-backed IPO, another study has shown the two types of PE investor impact differently on investee firm performance and this impact is mediated by the legal institutions in the given country (Bruton et al., 2010).

Considering that the nature of Chinese financial market setting is very different from the West, it is worth asking how institution settings in this country help to shape the PE industry. To answer this question, Bruton and Ahlstrom's study (2003) interviewed PE investor who were investing in China between 1998 and 2000. The authors find that China's institutional environment creates a number of significant different from the West,

including: (a) The portfolio firm selection process lacks regulatory protection, normative institutions and reliable accounting information. (b) Profit maximization cannot be regarded as a motivation for portfolio firms. (c) Structuring of relationships with firms and governments largely depends on *guanxi*. (d) Exit opportunities through IPO are limited than the purchase by strategic investor. Since this paper is written in the early 2000s, lots of changes and developments have been processed in the past 10 years. For example, the last point is found to be invalid in the Chinese PE market anymore and IPO has become the most welcomed PE exit route.

Based on our observations of on the characteristics of Chinese PE market from chapter 2, we have developed the following hypothesis to be tested in chapter 4:

Hypothesis 4a: PE investors have significant impact on new board listed firms than main board listed firms.

Hypothesis 4b: Domestic PE investors have significant impact on portfolio firms than their non-domestic competitors.

Hypothesis 4c: PE investors have significant impact on non-state-backed portfolio firms than on firms with state ownership.

In addition, due to the nature of the Chinese IPO market (to be introduced in chapter 5), we propose the following hypothesis:

Hypothesis 4d: PE investment on IPO firms are for speculation purpose rather than improving firm performance in the long-run.

Chapter 4 Motivations for receiving PE investments

4.1 Introduction

The conventional wisdom is that the professional PE investor has a deep understanding of the private equity landscape in nontraditional markets based on former investment experience (Gilligan and Wright, 2010; Povaly, 2007; Cornelius, 2011). PE investment can reduce the presence of the asymmetric information problem and help to signal the intrinsic value of the portfolio firms to the market and to other potential investors (Janney and Folta, 2003; Engel and Stiebale, 2009). PE investment is also an important source of financing for SMEs, especially in cases where intangible assets are the core business (Capizzi et al., 2011). Additionally, in the case of buyouts, after PE investors become majority shareholder of a firm, they solve the agency conflict by aligning the interests of managers and shareholders (Hellmann and Puri, 2002; Wright et al., 2009). By investing into younger, smaller firms in high-tech sectors , PE investors are able to generate above market returns and these PE portfolio firms outperform similar firms without PE investment (Gompers and Lerner., 2000; Davila et al., 2003; Alemany and Marti, 2005). A report from the Boston Consulting Group indicates that more than 70% of PE deals resulted in portfolio firms' annual profit growth rate (measured by annual EBITDA) by at least 20%, and nearly half of the PE deals received profit growth (measured by annual EBITDA) of 50% a year or more (BCG, 2012).

As discussed in chapter 2, it is clear that the Chinese PE market differs from the mature markets in several ways, including a much larger market size (Preqin, 2015), a less developed capital market (Bruton and Ahlstrom, 2003; Pukthuanthong and Walker, 2007),

PE investors normally become minority shareholders in their Chinese portfolio firms (Cao et al., 2014) and PE investors make use of IPO as an efficient exit channel, It seems reasonable to assume that not all results found for PE in the US and Europeans countries will be valid for the Chinese market. Consequently, this chapter aims to fill the gap in the literature by examining the motivations for receiving PE investment for Chinese firms and detecting the factors that drive the recipient of PE investment.

We study a sample of 195 PE portfolio firms and matched them with 318 similar firms without PE investment using the Propensity Score Method (Abadie and Imbens, 2002; Acharya et al., 2010; Leslie and Oyer, 2013). Testing hypotheses based on different theories on motivations of receiving PE investment, namely financing for investment and growth theory, signaling theory and agency theory, have been constructed in chapter 3. We use Probit and Logit regression as our empirical models to test the relationship between the probability of receiving PE investment and the proposed testing variables. It is not surprising to find out financing and signaling are not the primary reasons for receiving PE investment given that the Chinese PE market is largely driven by IPO. The signaling effect from stock market event study further confirms that there is no significant stock market reaction to the announcement of PE investment. Moreover, from the agency perspective, we find there is a positive and significant relationship between the existence of a largest shareholder and the probability of receiving PE investment, which matches PE investor's role as a minority shareholder. The above findings are consistent for both whole sample firms and new board listed firms.

The contribution of this chapter is twofold. Firstly, we advance the knowledge of PE

investment in China by comparing it with other existing literatures. It is interesting to see how the theories concerning PE motivations in mature markets are applied to the Chinese PE market, which features as a lack of financing, ownership concentration and an IPO 'hot issue' market. Secondly, this study examines the relevance of different motivation theories using a matched sample method by collecting PE-backed firms and non-PE-backed firms for the period 2000-2011. Recently, there are a few studies discuss the reasons on why firms receive PE investment before IPO. For example, Zhang and Li (2012) compare 185 PE-backed IPOs to 73 non-PE-backed IPOs from the period September, 17, 2009 to February 28, 2011. The authors describe that the motivation of receiving PE investment is to improve the CSRC passing rate for listing. We adopt different theories to examine the motivations of receiving PE investment and we use a much longer observation period and a larger sample size than other studies, which may give us a deeper understanding of this topic.

This chapter is tightly connected with the next empirical chapter (chapter 5), which evaluates the impact of PE investment on the portfolio firms. Although the theoretical background are similar for both empirical chapters, each chapter has a different empirical focus. Chapter 4 prioritizes on existing theories that can possibly explain the motivations for receiving PE investment, meaning the *ex-ante* factors. While chapter 5 provides evidence on how PE affects their Chinese portfolio firms' operating performance and examines the post-PE performance in the long run, meaning the *ex-post* factors.

The rest of this chapter is organized as follows. The empirical analysis is provided in

section 2, based on the literature review and hypotheses from chapter 3. This section reports data description, the constructions of proxy variables and how Propensity Score Method is used for generating the sample of matched firms. A conclusion is provided in section 3. An explanation of the Propensity Score Method is provided in an Appendix 4.1.

4.2 Empirical analysis

4.2.1 Data

In Chapter 2, we have identified a sample of 364 PE deals from 307 PE-backed firms from Chinese mainland stock markets during the period 2000 to 2011. Firm-specific information is collected from China Stock Market and Accounting Research Database (CSMAR). PE related information is collected from Asia Venture Capital Journal Dataset (AVCJ). As discussed previously, a large number of our sample firms received PE investment before IPO. These firms' related information can only be accessed three years before IPO due to the information disclosure requirement from CSRC. According to the available financial statements and corporate governance information, a sample of 195 portfolio firms is used as matched samples for this chapter.

4.2.2 The propensity score matching (PSM) estimation

The matched firm approach is used to identify a set of firms that are similar to our PE portfolio firms but not backed by PE investment, which helps to compare and explain the motivations of receiving PE investment. The idea is, by comparing PE-backed firms and non-PE-backed firms, if one proxy is found to be significantly different between PE-backed group and the matched samples, such proxy can be regarded as motivation for receiving PE investment. Theoretically speaking, the selected firms do not differ from PE portfolio firms regarding firm's basic characteristics. To achieve this, the Propensity Score Matching (PSM) method is adapted, which refers to pairing of treatment and control groups with similar values on the propensity score in order to discard the unmatched groups. The concept of PMS was first introduced by Rosenbaum and Rubin

(1983). The specific propensity score matching implementation we use is based on Abadie and Imben's (2002) application of the idea from Rosenbaum and Rubin (1983). The detailed analysis on the statistical definition is provided in the Appendix 3.1. Similar to Acharya et al. (2009) and Leslie and Oyer (2008), the nearest neighbor propensity score matching method is used to ensure that those matched samples are as comparable as possible. For a given treated subject, the nearest neighbor matching method selects the untreated group whose propensity score is closest to that of the treated group. For a given treated group, one could identify multiple untreated groups whose propensity scores lay within a specified distance of the treated group.

In our case, the PE-backed firms are regarded as the 'treated group' and the matched firms are regarded as the 'control group'. The selection process is as follows: firstly, we identify Chinese listed nonfinancial firms that match PE-backed IPO firms in terms of the year of listing and the CSRC two-digit industry classification and treat them as candidate non-PE-backed IPOs that can be possibly matched with PE-backed IPOs in our sample. We control the year effect to avoid selection bias for the matched group. The reason for the controlling of industry effect is because some industries receive more PE investment than others (as reported in Panel 6 from Table 2.4, the majority of PE investment took place in the manufacturing industry). Secondly, we calculate the absolute distance in propensity score based on firm size between each PE-backed IPO firm and non-PE-backed IPO firms from step 1. More specifically, we use the Stata command *psmatch* to calculate propensity scores. We require the maximum difference between the matching firm and the portfolio firm to be below 5% in absolute value (caliper=0.05). Because the majority of PE-backed

IPOs are listed on the two new stock markets after 2004, a significant amount of PE-backed IPOs have no non-PE-backed IPOs to be matched. In addition there are also some matched firms whose information on accounting or corporate governance is missing from CSMAR database. Thirdly, we calculate the absolute distance in propensity score between each PE portfolio firm and firm generated from step 1 based on firm size. After the above three steps, a sample of 318 non-PE peers from 2000-2011 is generated as our matching firms. In Table 4.1, we present the comparison between PE-backed group and the matched group in terms of firm performance, measured by firm size (the natural logarithm of total assets), and leverage ratio (total debt scaled by total assets). These two variables capture the basic firm performance information and confirm the minimal observable difference in our motivation testing between PE-backed firms and their non-PE peers. We find no significant differences between these three indicators. As a result, we can say that the propensity score matching is able to eliminate most of the differences in firm characteristics.

Table 4.1 Propensity Score Matching testing results of PE-backed firms peers

In this table, we identify control samples using a propensity score matching procedure. Three firm performance controlling variables are used, including firm size (the natural logarithm of firm size) and leverage (leverage ratio is measured by total debt over total assets). The mean of non-PE-backed firms reported are after the 'nearest-neighbour-matching' process.

	N	Mean	Median	Std. Dev	Min	Max	Diff t-test
Lnsize							
PE-backed	195	20.52		1.4	18.32	26.55	-0.27
Peers	318	20.21		1.17	18.31	25.25	
Leverage							
PE-backed	195	0.29		0.80	0.003	11.13	0.97
Peers	318	0.26		0.467	0.001	5.108	

Data source: *CSMAR China Stock Market Trading Database and Asian Venture Capital Journal Database*

4.2.3 Empirical model and measurement of variables

To test the motivation for receiving PE investment, we follow the Probit model method used by Pagano et al. (1998). In their paper, the authors proxy the variables that affect IPO listing using the maximum likelihood Probit model. From the empirical results, the authors prove that company size, growth rate, ROA and industry market-to-book ratio variables are significant and so can be used as motivation factors for a firm to go public. Similarly, for our case, if a proxy is found to be statistically significant between similar firms that are with or without PE investment, this proxy can be severed as a motivation indicator for PE investment.

Based on the theoretical predictions on variables that may affect the likelihood of PE investment, we use both Probit and Logit model as our empirical models

$$\begin{aligned}\Pr(PEdummy=1) = F(&\alpha_0 + \alpha_1 Lnsize_{it-1} + \alpha_2 Leverage_{it-1} + \alpha_3 Age_{it-1} \\ &+\alpha_4 Ave\_profit + \alpha_5 State\_dum_{it-1} + \alpha_6 Sales_{it-1} \\ &+\alpha_7 HI_{it-1} + \alpha_9 L\arg est_{it-1} + \alpha_{10} Year + \alpha_{10} industry)\end{aligned} \tag{4.1}$$

The dependent variable is binary: it takes 1 for PE-backed firms and 0 for non-PE-backed peers. The dependent variable is defined as year t when PE investment took place. The independent variables are collected from firm's $t-1$ annual report because the effects from lagged factors are observed in year t. For non-PE-backed firms, year t is defined as the year in which their PE-backed peers received PE investments. For financing for investment and growth theory, the testing variable is sales growth rate $(Sales)$, which is defined as the rate of change in sales in year y-2 and y-1 (Bo et al., 2010). For signaling effect, two variables are used: the average EBIT in the past three years (Ave_profit); whether the firm is backed by state ownership $(State\_dum)$, which equals 1 if the state

ownership exists and zero otherwise. In terms of agency theory testing, the following variables are constructed: concentrated ownership (HI), measured by the Herfindahl Index, is the squared sum of share percentages held by top_4 shareholders (Demsetz and Lehn, 1985; Hovey et al., 2003); the shares controlled by the largest shareholder ($L\arg est$) (Xu and Wang, 1999). We also control for the firm performance indicators of firm size and leverage ratio firm age. The first two variables have been defined previously. Firm age (Age) is the age when PE investment took place. Year effect and industry effect are also controlled. A summary of variables in reported in Appendix 4.2.

Table 4.2 reports the characteristics of PE-backed firms and non-PE-backed firms (apart from the two variables that have been reported in Table 4.1). We observe that PE-backed firms are younger on average and the difference is statistically significant (t = -2.6378). Although the sales growth rate appears to be higher for the non-PE cases, the difference between the two groups in sales growth is not statistically significant (t = 0.0218). These results provide initial evidence that the need for external financing may not be a motivation for PE investment. PE-backed firms also have slightly lower profitability ratios than non-PE-backed firms, although the different is not significant (t = -1.3227). A similar result is found for the state dummy variable, in which less PE-backed firms are with state ownership, yet the difference is not significant (t= -1.0624). Regarding agency theory, the values for both concentrated ownership and largest shareholder ownership are higher in PE-backed firms. In addition, the difference is significant for largest shareholder variables (t=7.8510). The above results give us an initial impression that the motivation for receiving PE investment may not be attributed to financing or signaling purpose.

Table 4.2 Descriptive statistics

This table presents the summary statistics of 195 PE deals and 318 non-PE peers. The sample period is 2001-2011. Firm age (*Age*), is the age of firm at the time of PE investment. For non-PE-backed firms, *Age* measured is defined as the year in which their peers received PE investments minus its establishment. Sales growth rate (*Sales*) is defined as rate of change in sales. The average profitability (*Ave _ profit*) is the average return on assets the past three years. The state ownership dummy (*State _ dum*) indicates whether the firm is backed by state ownership. Concentrated ownership (*HI*), measured by the Herfindahl Index, is the squared sum of share percentages held by top4 shareholders. The largest ownership (*Largest*) is the ratio of shares controlled by the largest shareholder.

	PE-backed firms			Non-PE-backed firms			t-Test statistics
Variable	Obs	Mean	Std. Dev.	Obs	Mean	Std.Dev.	
Age	195	7.1180	5.2653	318	8.3365	4.9614	-2.6378
Sales	195	0.2361	0.5175	318	0.2212	0.0218	0.3706
Ave _ ROA	195	0.1547	0.1376	318	0.1614	0.1267	-1.3227
State _ dum	195	0.6205	0.4865	318	0.6667	0.4721	-1.0624
HI	195	0.2119	0.1526	318	0.2008	0.1236	0.8992
Largest	195	0.5567	0.4981	318	0.2327	0.4232	7.8510

Data source: *China Stock Market Financial Statements Databases*

4.2.4 Results and discussions

The first four columns in Table 4.3 Panel 1 report equation (4.1) using a cross-section Probit model. For control variables, both firm size and leverage ratios are insignificant which is consistent with our previous explanations. The estimated coefficient for firm age control variable is negatively significant, suggesting that younger firms are more likely to undertake PE investment. In the first three columns, the hypothesis for different theories are reported respectively while in column (4) the whole model results are presented. The first column reports hypothesis 2a for financing for investment and growth theory. The estimated coefficient for sales growth rate has a positive sign but the coefficient is insignificant in both column (1) and (4). The second column outlines hypothesis 3a and 3b for signaling theory. The estimated coefficient for Ave_profit is negatively insignificant, implying that firms with better profitability performance in the past years have lower motivation to receive PE investment compared to the matched sample firms however this variable is insignificant. The other proxy $State\_dum$, is also negative in column (2) and (4), suggesting that firms backed with state-owners are less motivated in receiving PE investment than their non-state-backed peers but the effect is insignificant. Both hypotheses results suggest that signaling may not be a motivation for receiving PE investment. Hypothesis 4b and 4c for agency theory are reported in column (3). The coefficient for concentrated ownership turns out to be positively insignificant in both column (3) and (4). A positive and significant relationship between the largest shareholder and PE investment is found in column (3) and (4), showing that the existence of a largest shareholder is related to a higher motivation for receiving PE investment.

Taken together, the empirical results demonstrate that financing for investment and growth or signaling are not the motivations for receiving PE investment. Alternatively, we notice that there is a positively significant relationship between the existence of a dominant largest shareholder and the probability of receiving PE investment. To explain this observation, the characteristics of Chinese SME should be taken into account. For our sample observations, the ownership is tightly controlled by the founder of the firm with over 30% of total ownership. We also observe that, in firms from high-tech industries, the average holding of the largest shareholder can be as high as 58.64% (Shapiro et al., 2015). Commonly, the management team members are selected within the range of family members and/or close friends. In this style of business structure, coordination and control are highly personal and there is tight control of financial and production management (Tsang, 2001). PE investor's only take a small portion of the shares and they play limited role in corporate governance. As a result, the largest shareholders do not feel threatened by the entry of PE investors. Consequently, these largest shareholders have higher motivations in receiving PE investment and enjoy the investors' benefits from PE investment.

Further insights into the motivation for receiving PE investment can be obtained from new board listed firms, based on the fact that the majority of our PE-backed firms come from new boards. To answer the question of whether these SME firms have different motivation for receiving PE investment, we repeat equation 4.1 for new boards' listed firms as our alternative check. The results are reported in Table 4.3 column (5) to (8). The results concerning control variables indicate that younger firms undertake more PE

investments than those of mature firms. Similar to the whole sample results, a positive but insignificant relationship is found between sales growth rate and PE probability. It is also noticed that firms with higher profitability records and firms backed by state ownership are not reasons to explain PE motivations. In consistent with the whole sample results, the largest shareholder variable is positively significant while the concentrated ownership variable is positively insignificant for new board listed firms.

We repeat equation 4.1 for whole sample and new board sample using a Logit model and find similar results. The Logit model results are presented in the Table 4.3 Panel 2.

Table 4.3 Motivations for receiving PE investment

The effect of the variables on the motivation to receiving PE investment is estimated by using both Probit and Logit regression. The estimation method is maximum likelihood. The sample contains 195 PE-backed and 318 non-PE-backed firms. The sample period is from 2000-2011. The empirical model is defined as the follows:

$$\Pr(PEdummy = 1) = F(\alpha_0 + \alpha_1 Lnsize_{it-1} + \alpha_2 Leverage_{it-1} + \alpha_3 Age_{it-1} + \alpha_4 Ave\_profit + \alpha_5 State\_dum_{it-1} + \alpha_6 Sales_{it-1} + \alpha_7 HI_{it-1} + \alpha_9 Largest_{it-1} + \alpha_{10} Year + \alpha_{10} industry)$$

Firm age (Age), is the age of firm at the time of PE investment. For non-PE-backed firms, Age measured is defined as the year in which their peers received PE investments minus its establishment. Sales growth rate ($Sales$) is defined as rate of change in sales. The average profitability (Ave_profit) is the average EBIT the past three years. The state ownership dummy ($State\_dum$) indicates whether the firms is backed with state ownership. Concentrated ownership (HI), measured by the Herfindahl Index, is the squared sum of share percentages hold by top4 shareholders. The largest ownership ($Largest$) is the ratio of shares controlled by the largest shareholder. Both industry and year effects are controlled. The figures in parentheses are the t-statistics.

Panel 1 Probit results

variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Lnsize	0.1044	0.0932	0.0291	0.0173	0.1044	0.0841	0.0360	0.0059
	(2.14)	(1.83)	(0.57)	(0.31)	(1.80)	(1.37)	(0.59)	(0.09)
Leverage	0.0506	0.0535	0.0895	0.0982	0.0441	0.0454	0.0839	0.0830
	(0.53)	(0.56)	(0.90)	(0.98)	(0.44)	(0.46)	(0.80)	(0.79)
Age	-0.0323	-0.0329	-0.0333	-0.0335	-0.0758	-0.0778	-0.0766	-0.0771
	(-2.74)	(-2.78)	(-2.74)	(-2.72)	(-4.58)	(-4.68)	(-4.58)	(-4.58)
Sales	0.008			0.0412	0.0644			0.1211
	(0.06)			(0.29)	(0.42)			(0.73)
Ave_ROA		-0.4519		-.4199		-0.6205		-0.7204
		(-0.96)		(-0.82)		(-1.14)		(-1.20)
State_dum		-0.1632		-0.2409		-0.1333		-0.1405
		(-1.34)		(-1.45)		(-0.91)		(-0.71)
HI			0.3503	0.9510			0.3471	0.7405
			(0.78)	(1.60)			(0.67)	(1.07)
Largest			0.0926	0.8957			0.7465	0.7083
			(7.18)	(6.88)			(4.85)	(4.50)
Industry	*Included*	*Included*	*Included*	*Included*	*Included*	*Included*	*Included*	*Included*
Year	*Included*	*Included*	*Included*	*Included*	*Included*	*Included*	*Included*	*Included*
Pseudo−R2	0.0428	0.0470	0.1210	0.1250	0.0686	0.0728	0.1161	0.1201
F_test(p−value)	0.0000	0.0000	0.0000	0.0000	0.0007	0.0006	0.0000	0.0000
Obs	513	513	513	513	365	365	364	364

Panel 2 Logit results

variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Lnsize	0.1703	0.1537	0.0521	0.0312	0.1679	0.1354	0.0605	0.0088
	(2.17)	(1.87)	(0.61)	(0.34)	(1.78)	(1.36)	(0.60)	(0.08)
Leverage	0.0804	0.0860	0.1466	0.1604	0.0663	0.0703	0.1318	0.1307
	(0.54)	(0.58)	(0.94)	(1.02)	(0.43)	(0.45)	(0.80)	(0.79)
Age	-0.0533	-0.0537	-0.0539	-0.0539	-0.1229	-0.1260	-0.1260	-0.1273
	(-2.73)	(-2.73)	(-2.63)	(-2.61)	(-4.46)	(-4.54)	(-4.47)	(-4.48)
Sales	0.0234			0.0851	0.1109			0.2169
	(0.11)			(0.37)	(0.45)			(0.80)
Ave_ROA		-0.6930		-0.7091		-0.9926		-1.2062
		(-0.90)		(-0.84)		(-1.12)		(-1.22)
State_dum		-0.2610		-0.3965		-0.2147		-0.2471
		(-1.32)		(-1.42)		(-0.90)		(-0.75)
HI			0.6007	1.5849			0.5610	1.2411
			(0.81)	(1.61)			(0.65)	(1.09)
Largest			1.5065	1.4586			1.2252	1.1646
			(7.01)	(6.74)			(4.80)	(4.47)
Industry	*Included*	*Included*	*Included*	*Included*	*Included*	*Included*	*Included*	*Included*
Year	*Included*	*Included*	*Included*	*Included*	*Included*	*Included*	*Included*	*Included*
Pseudo−R2	0.0431	0.0470	0.1202	0.1241	0.0681	0.0721	0.1158	0.1202
F_test(p−value)	0.0036	0.0024	0.0000	0.0000	0.0008	0.0007	0.0000	0.0000
Obs	513	513	512	512	365	365	364	364

4.2.5 Robustness check using an event study

Apart from using Probit and Logit regression as empirical models, another commonly used empirical method is event study. Event study, outlined by Campbell et al (1997) and developed by Fama et al (1969), is used to measure the signaling effect of market reactions to a certain announcement.

Because the majority of our samples are pre-IPO firms, our previous hypothesis is mainly based on the motivation for receiving PE investment before IPO. However, this hypothesis may not be useful for explaining why listed firms require PE investment. For example, because the firm is already listed, financing for investment and growth theory may not be a motivation for seeking PE investment. As a result, we adopt the event study as a robustness check to see whether receiving PE investment plays a positive role in stock market pricing, which can help to explain the signaling effect.

The event study is based on the assumption that, given the rationality in the marketplace, the effect of an event announcement will be reflected immediately in stock market prices. The use of this method includes the following steps: select the sample; determine the measurement of abnormal return; define the event; outline a procedure for estimating the abnormal return; outline a procedure for testing the hypotheses; present and interpret the empirical results (Campbell et al., 1997). A number of studies have adopted the event study method to test the signaling effect after PE announcement (Wruck, 1989; MacKinlay, 1997; Ma et al., 2009; Wu et al., 2005). In the event study, if the announcement of an investment increases the abnormal return, then the investment does

implement the signaling effect. In addition, if there is no post-announcement drift on stock prices, then the effect of such investment can be regarded as permanent.

Our sample firms are defined as firms that received PE investment after IPO. After excluding pre-IPO-backed IPO firms, we are left with a sample of only 50 PE-backed listed firms from the period 2000-2011. Because of the small sample size, we do not differentiate firms by stock boards and we use the Shanghai Composite Index to measure market returns for all sample firms. Both security daily stock returns and market index information are collected from CSMAR dataset.

The expected return is the return expected if the event did not occur and the abnormal return is the difference between the expected normal return and the actual return (MacKinlay, 1997). There are four models that are commonly used to estimate the expected returns, including 1) the constant-mean-return model; 2) the market model; 3) factor models; 4) the market-adjusted-return model. The constant-mean-return model assumes that the expected return is constant through a time period whereas the market model assumes that there is a linear relationship between market return and the return of a stock (MacKinlay, 1997). Compared to the constant-mean return model, the market model removes part of the return that is related to variation in the market returns, which can help to decrease the variance of the abnormal returns (Campbell et al., 1997). The factor models include other factors than the market return as explanatory variables to explain the abnormal returns[32]. The market-adjusted-return model is used when we do not

[32] According to Campbell et al (1997), the benefits from employing multifactor models are limited, because the

need an estimation period for estimating the expected returns. Based on the different characteristics of the event study methods, we adopt the market model and define it as follows:

$$R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it}, \text{ where } R_{it} = (\frac{P_{it}}{P_{it-1}}) - 1 \qquad (4.2)$$

Where R_{it} and R_{mt} are the returns for period t for security i and the market index respectively t is the time index and i stands for different firms. ε_{it} is the error term for security i for period t and is expected to be mean zero and the variance equals to $\sigma^2_{\varepsilon_i}$. P_{it} and P_{it-1} are the closing prices for security i at time t and time t-1 respectively.

The expected return is defined as:

$$E(R_{it} \mid X_i) = \alpha_i + \beta_i R_{mt} + \varepsilon_{it} \qquad (4.3)$$

The abnormal return can therefore be defined as:

$$AR_{it} = R_{it} - E(R_{it} \mid X_i) \qquad (4.4)$$

The abnormal return is measured over an event window, which comprises the number of event days we want to examine. The daily abnormal returns are summarized over the event window to derive the cumulative abnormal returns (CARs):

$$CAR_{i(T_1-T_2)} = \sum_{T_1}^{T_2} AR_{it} \qquad (4.5)$$

Where CAR_i is the cumulative abnormal return for firm i over the event window (T2, T1). When we investigate the effect on the announcement of a PE investment, not only does the effect across days but also across different securities are to be measured. Therefore, we propose to calculate the average CAR for each individual securities. The

marginal explanatory power from each variable is limited.

measurement is called the cumulative average abnormal return ($CAAR$) and can be calculated using the formula as follows:

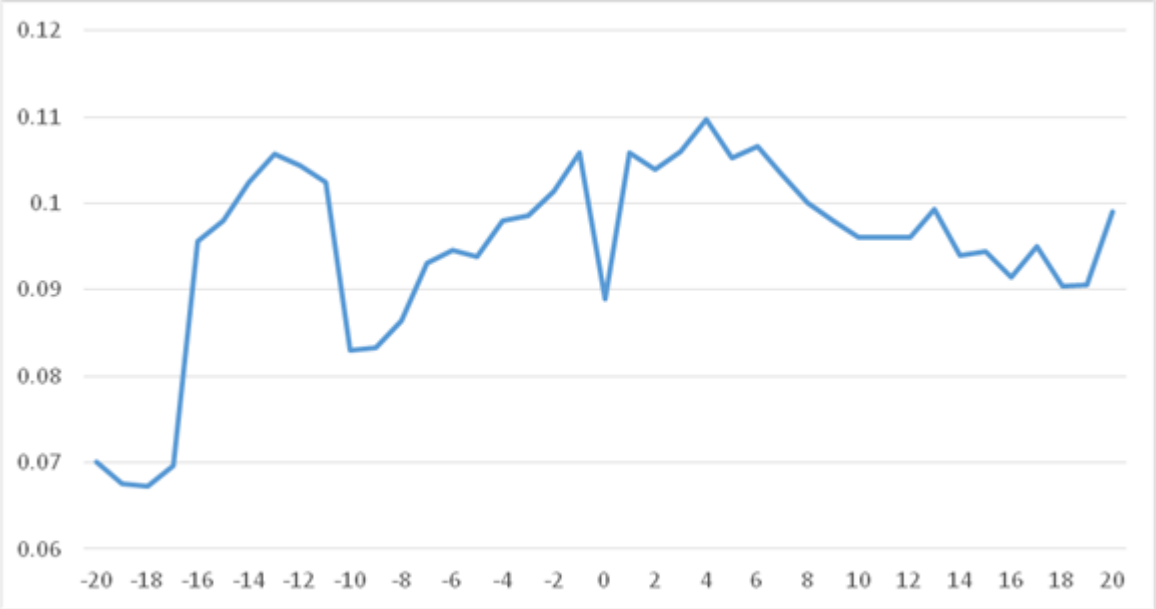
$$CAAR = \frac{1}{N}\sum_{i=1}^{N} CAR_i \qquad (4.6)$$

Another important issue on using the event study method is to define the measure of R_{mt}, which is normally measured by using the return of a market index.

Our Event study is constructed following Wruck (1989), MacKinlay (1997), Ma et al. (2009) and Wu et al. (2005). We collect the information of PE investment announcement day from AVCJ database and define it as day 0. The event window (or the estimation period) runs from day (-15) through day (+15). The abnormal returns are calculated for each security and then averaged across firms for the event days. A standardized test statistic is constructed to determine whether the mean abnormal return is significantly different from zero. The cumulative average abnormal return is also reported for each event window. Multiple event windows have also been added. One day after the announcement day can capture the market reaction if the announcement occurs after trading hours. One day prior to the announcement day can capture the market reaction to possible information leakages before the official announcement (Ma et al., 2009). However, accuracy will decrease when more days are included in the event window due to the possibility of confounding effects from other market events (MacKinlay, 1997). Therefore, to examine the sensitivity of the empirical results to different event window, we also highlight the CARs of two-day [-1, 0], [0, +1], three-day [-1, +1] and multiple-day [1, 20].

Figure 4.1 shows the CAR of our PE portfolio firms from day (-15) to day (+15) and we can see a graduate increasing trend before PE announce. There is a price drop on the announcement day but the returns increased in the following days after the announcement then dropped in the longer period. There is no significant PE announcement effect on stock returns.

Figure 4.1 Cumulative abnormal return to PE announcement (day -20 to day 20)



Data source: PE-backed firm's daily share return data is collected from China Securities Market and Accounting Research (CSMAR) database; PE announcement information is from Asian Venture Capital Journal (AVCJ) database.

Table 4.4 presents daily average abnormal returns, cumulative average abnormal returns, cumulative average abnormal returns from day (-15) up to day (+15) on the announcement of a PE investment. Significant positive average abnormal returns are found before the announcement day. The average abnormal return is 0.46% in day (-1), which is higher than the 0.27% average abnormal returns in day (-2). Moreover, the average abnormal return falls slightly on the event day, which equals to -1.7%. After the event day, abnormal returns keep a general positive trend in the following days but decrease afterwards. We highlight the CARs of two-day [-1, 0], [0, +1], three-day [-1,+1], and multiple-day [-3,0] and [1,20] event windows at the bottom of Table 4.4. The selection of event windows is similar to Wruck (1989) and Ma et al (2009). In the first event window, a negative but significant CARs is observed between day (-1) and day (0) (z=-1.9446). In the event window day (0) to day (+1), the CAR is statistically insignificant (z=-0.1668). Combining the returns from day (-1) to day (+1), the CARs turn out to be positive but insignificant (z=0.7191). If we take a look at the multiple-day event windows, the CARs from day (-3) to the event day is negatively significant (z=-1.4164). However, after the event day, the CARs from day (+1) to day (+20) is positively insignificant (z=0.8669). The event study results show the market reaction is not very positive to the announcement of PE investment. We also notice that there is a post-announcement drift in stock prices, which is in contrast to the findings of Wruck (1989). The results indicate PE investment does not play a significant signaling role in the listed portfolio firms.

Table 4.4 Market reaction to the private equity announcement

This table presents daily average abnormal stock returns (AAR), cumulative average abnormal returns (CAR) and t-values for a sample of 50 PE-backed listed firms from 2000-2011 period. The event days are calculated from -15 up to 15, where the PE announcement day is defined as event day 0. We also highlight CARs for the two-day and three-day announcement windows, and their z-values at the bottom of the table.

Event days	Average abnormal return	Cumulative average abnormal returns	Test statistics
-15	0.0023	0.0980	1.9107
-14	0.0044	0.0067	1.9970
-13	0.0033	0.0100	2.0616
-12	-0.0013	0.0087	2.0357
-11	-0.0020	0.0068	1.9977
-10	-0.0195	-0.0127	1.6183
-9	0.0004	-0.0124	1.6252
-8	0.0031	-0.0092	1.6864
-7	0.0066	-0.0026	1.8146
-6	0.0015	-0.0011	1.8445
-5	-0.0008	-0.0019	1.8292
-4	0.0042	0.0023	1.9103
-3	0.0006	0.0029	1.9228
-2	0.0027	0.0057	1.9762
-1	0.0046	0.0102	2.0657
0	-0.0170	-0.0068	1.7339
1	0.0170	0.0102	2.0645
2	-0.0019	0.0083	2.0272
3	0.0021	0.0104	2.0682
4	0.0037	0.0140	2.1394
5	-0.0044	0.0096	2.0534
6	0.0013	0.0110	2.0795
7	-0.0033	0.0076	2.0144
8	-0.0032	0.0045	1.9527
9	-0.0021	0.0023	1.9116
10	-0.0019	0.0004	1.8739
11	0.0000	0.0004	1.8736
12	0.0000	0.0004	1.8728
13	0.0033	0.0037	1.9375
14	-0.0054	-0.0017	1.8325
15	0.0004	-0.0013	1.8407
		CAR	z-statistics
2-day	[-1,0]	-0.0124	-1.9446
	[0,1]	-0.0013	-0.1968
3-day	[-1,1]	0.0045	0.7191
multiple-day	[-3,0]	-0.0090	-1.4164
	[1,20]	0.0055	0.8669

Data source: CSMAR China Stock Market Trading Database

4.3 Conclusion

General knowledge of private equity investment usually focuses on fund performance and portfolio firm performance but little is known about the motivation for seeking PE investment (Cao et al., 2014). In this chapter, we study the motivation explanations from mature market evidence using Chinese data and help to provide new insights to the existing western literature and adding Chinese evidence. The key findings are as follows: first of all, although lack of financing is common in Chinse SMEs, the purpose of PE investment is not to get external funding which is shown by the insignificant results from financing for investment and growth theory. This finding supports the fact that our samples are listed of ready-listed firms, indicating that they are less likely to be problematic in their financial statement to meet the listing requirements. This finding also suggests the potential data bias problem for our data selection. Secondly, firms with better profitability track records and state-ownership are not motivated in signaling themselves for PE investment. The stock event study further confirms insignificant signaling effect by showing that the announcement does not have a lasting positive effect on share values. Thirdly, from agency theory perspective, we find that concentrated ownership helps to increase the likelihood of receiving PE investment, especially when there exist a largest shareholder the relationship, the indicator becomes significant. This finding subsidizes the minority shareholder role of PE investors. These motivation examination results do not differentiate between new board listed firms and the whole sample. Because the existing theories cannot fully explain why firms receive PE investment in China, we wonder PE investment in China may fulfill another role in their portfolio firms which will be further discussed in the following Chapter 5 and Chapter 6.

Chapter 5 The impact of PE investment on portfolio firm performance

5.1 Introduction

Following the central hypothesis from Jensen (1989), Private equity investment is regarded as an efficient tool for a PE portfolio firm to experience higher growth in several ways: in providing financing for the firm's further development, in signaling the capability and growth opportunity of the firm to outside investors and in solving the principal-agent conflict. The existing literature shows that PE investors who have accumulated superior past industry experience can pick up high potential growth firms more easily (Gilligan and Wright, 2010; Povaly, 2007). On one hand, the enrollment of PE investors can improve the corporate governance operation in the portfolio firms, helping to improve firm performance and mitigate agency conflict between managers and shareholders (Wright et al., 2009). On the other hand, the entry of a PE investor can also send out positive signals regarding the intrinsic value of the firm and therefore attract the interest of future investors (Lerner, 1998; Kaplan and Schoar, 2005; Janney and Folta, 2005).

However, most of the existing research on PE-backed portfolio firm performance have concentrated on PE-backed buyout firms and the majority of these firms come from mature market economies, especially the US and Western European countries (Kaplan, 1989; Guo et al., 2011; Bernstein et al., 2010; Bruton et al., 2010; Wilson et al., 2012). It is questionable, whether theories and empirical evidence developed and gathered in major developed countries can be applied universally to other institutional settings, especially in fast growing economies like China. Chinese firms are operating in a transitional

environment in which both capital market and corporate governance perform differently from those of mature markets (Bai et al., 2004). These differences are due to several distinct features in China such as PE types and the role of PE investors. For example, buyout investment can hardly be found in the Chinese market. Instead, growth capital and Pre-IPO play a dominant role in the Chinese market and these PE investors normally become minority shareholder in their portfolio firms (a comparison of the differences between the Chinese PE market and other mature PE markets has been provided in chapter 2). The Chinese PE market has experienced tremendous growth in the past 10 years and the existing literature may not be able to provide sufficient explanations for the current development. As a result, there is an ongoing need to examine the operation of PE investment in China and to update the general literature by adding Chinese evidence. As Wood and Wright (2009) have indicated: there is an important need for systematic research to explore the rationale for such differences.

In this chapter, we examine how firms perform after receiving PE investment. We study a sample of 306 PE portfolio firms during the period 2000-2011, which includes 364 PE transaction deals. Four classic theories, including financing for growth and development theory, signaling theory, agency theory and institutional theory, have been adapted to explain the impact of PE investment on portfolio firms. In this chapter, we test the hypotheses developed in chapter 3 and provide evidence on how portfolio firms experience immediate profitability increase after PE investment, which seems to be consistent with the financing role of PE investment. However, we find the shareholding taken by PE investors is not always helpful for firm performance: occasionally it is

negatively related to firm performance. To capture more characteristics of the Chinese PE market, we carry out tests on four sub-groups, including sub-groups by PE type, by PE investors' countries of origin, by listing stock boards and by whether the PE investment is undertaken by joint-investors. We find some results that are further in line with the financing and signaling effect from PE investors. Nevertheless, we did not obtain any evidence supporting the governance role of PE investment in China. Taken together, we argue PE investment in China is aimed at short-term exit purpose and has no real effect on the portfolio firms. This is because (1) PE investors normally become minority shareholders and they play limited roles in corporate governance management in their portfolio firms. (2) The current booming PE market is resulted from a hot IPO market, which provides a quick and secure exit channel for PE investment. (3) The majority of the PE investment happened shortly before IPO to ensure PE investors can exit with high stock market returns. We further find PE investment does not lead to performance change in the long-term. As a result, PE investment in China is with short-term profit orientation and does not aim to improve firm performance in the long-term.

This research is a response to the increasing importance of the Chinese PE market in the global market and has made the following contributions to the general PE literature. (1) We update the existing PE literature by analyzing the characteristics of the Chinese PE market, addressing different PE types that are operating in China, introducing the latest booming Chinese market and evaluating firms' reactions to these PE investments. We have noticed that these questions are not answered clearly in the current PE literature. As a result, a good understanding of the operating environment of the Chinese PE market is

crucial in academic studies. (2) This study also contributes to the existing Chinese PE literature in several ways. Firstly, unlike the majority of the existing studies (Batjargal and Liu, 2004; Tan et al., 2013; Jiang et al., 2014) that focus on Chinese VC investment, this study contains all PE types that are available in the Chinese market, which enables a more detailed analysis of PE industry expansion in China and can therefore capture different characteristics among different PE types. Secondly, this study covers a more extended period of time. Instead of focusing on the PE expansion period after 2005, we include a long period (2000-2011) for our sample firms which can provide better understanding of the development of PE industry in China. Thirdly, this study contains by far the largest sample of PE portfolio firms. In order to increase our sample size, we include all the portfolio firms that undertake PE investment either before or after IPO. Based on the fact that most PE transactions happened not long before IPO, we are able to collect both accounting and stock market information for these portfolio firms. (3) Compared to the existed non-academic PE studies, which mainly focus on the technical operation of PE investment in China, this study fills the Chinese PE literature gap from the academic perspective.

The rest of this chapter is organized as the follows. In section 2, data and methodology is provided. In Section 3 we discuss how PE investment affects their portfolio firms in both short-term and long-term as well as the sub-sample testing. Section 4 concludes.

5.2 Empirical design

5.2.1 Data selection

Our data come from two sources. The first dataset contains PE investment information compiled by Asian Venture Capital Journal dataset (AVCJ). The listed firms' accounting information, including balance sheet, statement of cash flow and income statement, is collected from China Securities Market and Accounting Research dataset (CSMAR). Our data selection process is summarized as follows: firstly, PE deals are collected from 2000 to 2011. The majority of our sample PE deals happened after 2000 and PE investment happened before 2000 can cause heteroscedasticity due to the different economic environment and conditions in different time period. As a result, two PE-backed firms that received investment in the mid-90s are excluded from our sample. Secondly, we exclude financial firms from our sample. A number of 476 PE-backed listed firms are collected from the AVCJ dataset by the end of 2011 and a group of 25 PE-backed listed financial firms are eliminated from our dataset. Further, we map the necessary financial information for these sample firms from the CSMAR dataset. For the mapping step, we set aside firms with no accounting information available at the time of PE investment[33]. After the above procedures, 364 PE investments from 307 PE-backed firms that are listed on the Chinese mainland stock markets by the end of 2011 are used in our data sample. This sample covers PE-backed portfolio firms from 2000-2011, which contains the main history of PE-backed Chinese stock market firms and enables us to test the effect from PE investment along the progress of China's economic transition.

[33] Firms that are willing to be listed on the Chinese stock markets are required to provide financial information in the past three years. Some of our sample portfolio firms received PE investments before IPO. If the PE investment was made up to three years before IPO, we can still find available accounting information from CSMAR dataset. Otherwise, we exclude this firm from our sample.

5.2.2 Empirical models and measurement of variables

The aim of this study is to examine how PE investment affects their portfolio firms' accounting performance. To do this, performance indicators from standard literature and add PE information into the empirical models. More specifically, the return on assets (ROA) is used as the dependent variable to measure profitability performance (Wilson et al., 2012). The following controlling variables are included: Firm size ($Size$) is measured by the natural logarithm of a firm's total assets (Bruton et al., 2003; Wilson et al., 2012). Firm size indicates the financial constraints faced by the firm, for example, large size firms may have more external financing sources than smaller ones. Mixed results are found with regard to the relationship between firm size and profitability. Hall and Weiss (1967), Fiegenbaum and Karnani (1991) find a positive relationship while Shepherd (1972) and Beck et al., (2010) find a negative one. Other than these contradictory findings, Simon (1962) and Whittington (1980) indicate that firm size does not have an impact on profitability. Leverage ratio ($Leverage$), is measured by total debt over total assets. Leverage ratio is an important source of external financing and is complemented by equity financing (Wilson et al., 2012). A higher leverage ratio is likely to decrease the ROA because the high profitability firms are supposed to accompany with lower leverage ratio (Titman and Wessisl, 1988). Sales growth rate ($Sales$), is calculated by $(Sales(t+1) - Sales(t))$ divided by $Sales(t)$ where t is the year PE investment took place. Sales growth is an indicator of firm's growth potential (Huang and Song, 2002) and high growth rate leads to greater demand for borrowing. Year dummy and industry dummy are used as control variables in all estimations for time- effects and industry effects respectively. The industry dummy is defined following the CSRC two-digit industry classification guidance.

After controlling for profitability factors, we add in the following PE information variables as our testing proxies. (1) PE amount ($PEamount$) represents the size of PE investment and is calculated by total amount of PE investment scaled by total assets. It captures the most direct effect from PE investment and implies the effect of PE financing impact. This variable is for testing hypothesis 2a. (2) PE deal stake ($PEdeal$) measures the percentage of total shares held by PE investor for each transaction. This variable contains the ownership that has been transformed to outside PE investors and can help to represent the governance role of PE investors. This variable is for testing hypothesis 4d. (3) PE round ($Round\_dum$) indicates the frequency of PE investment, it takes 1 if this is the first PE investment to the portfolio firms and 0 otherwise. This variable also captures the preference of PE investors. If the portfolio firm has received more than one PE investment then we can say this firm is more attractive to PE investors because of their higher profitability and/or high growth rate. (4) We also differentiate our sample firms according to the timing of PE investment by using an IPO dummy variable (IPO_dum). This dummy variable equals 1 if PE investment happened before IPO and 0 if PE investment happened after IPO. IPO information dummy variable helps to control for market entry timing.

Our benchmark empirical model is specified as follows:

$$ROA_{it+1} = \beta_0 + \beta_1 \ln size_{it} + \beta_2 leverage_{it} + \beta_3 sales_{it} + \beta_4 PEamount_{it} + \beta_5 PEdeal_{it} + \beta_6 round\_dum_{it} + \beta_7 IPO\_dum_{it} + \beta_8 Industry + \beta_9 Year + \varepsilon_i \quad (5.1)$$

In the cross-section regression models, the year of PE investment is defined as *t*. All the dependent variable information is collected from year *t*. The information from *t+1* period is used for the independent variables because the impact of PE investment on financial

information will be observed in the following year. The definitions of the variables and their measurements are summarized in Appendix 5.1.

5.2.3 Sample distribution

Table 5.1 presents the Pearson correlation coefficients of our variables. A significant relationship between ROA and PE investment (*PEamount*) is observed, suggesting that the larger the PE investment, the greater the ROA. ROA also has a strong relationship with PE type dummy variable (*IPO _ dum*) and PE round dummy variable (*Round _ dum*). Regarding control variables, all three variables, namely firm size (*Size*), leverage ratio (*Leverage*) and sales growth rate (*Sales*), have a strong relationship with ROA .We do not find a strong relationship between ROA and the ownership controlled by PE investors (*PE*deal).

Table 5.1 Pearson Correlation coefficients

This table presents the correlation coefficients of 364 PE deals from 307 PE-backed listed firms on mainland stock markets from 2000 to 2011. *ROA* is measured by net income over total assets. Firm size (*Size*), is measured by the natural logarithm of a firm's total assets. Leverage ratio (*Leverage*), is measured by total debt over total assets. Sales (*Sales*) is defined as sales growth rate, calculated by sales rate in year t+1 minus sales rate in year t divided by sales rate in year t. PE amount (*PE*amount), is the size of PE investment over firm's total assets. The deal stake of PE investment (*PE*deal), measures the percentage of total amount of shares held by PE investor for each transaction. PE round dummy variable (Round_*dum*) equals 1 if this is the first time for PE investment and 0 otherwise; PE type dummy variable (*IPO_dum*) equals 1 if PE investment is made before listing and 0 if the investment is made after listing.* Indicates statistically significant at 5% level.

No	Variables	1	2	3	4	5	6	7	8
1	*ROA*	1							
2	*Size*	-0.4597*	1						
3	*Leverage*	-0.3761*	0.3325*	1					
4	*Sales*	0.1200*	-0.0874	0.0929	1				
5	*PE*amount	0.2485*	-0.2682*	-0.1938*	0.0831	1			
6	*PE*deal	-0.0181	-0.0898	0.0870	0.0550	0.3862*	1		
7	Round_*dum*	-0.1038*	0.0664	0.2019*	-0.0281	0.0846	0.1730*	1	
8	*IPO_dum*	0.4199*	-0.5131*	-0.0701	0.1876*	0.0071	-0.0834	-0.1567*	1

Table 5.2 presents the descriptive statistics for 364 deals from 307 PE-backed listed firms between 2000 and 2011. The mean ROA is 12.17%. The average leverage ratio is 47.23% and ranges from the lowest 3% to the highest 108%, showing a high debt ratio exists in PE portfolio firms. The sales growth ratio is 32.13% on average, while the higher growth rate is 532% and the lowest rate is -0.41%. For PE measurements, the size of PE investment ($PEamount$) accounts for 9% of firm size on average, indicating the inflow of PE fund is very small compared to the actual firm size, suggesting the financing role of PE investment is not significant. In exchange for the PE funds, PE investors take an average of 10.94% firm ownership and PE *deal stake* ($PEdeal$) ranges from 0.12% to 100%. PE round dummy variable ($Round\_dum$) shows 79.28% of the sample firms received their PE investment for the first time and the rest of the sample firms received repeated PE investment. PE type dummy variable (IPO_dum) indicates that 85.16% of the portfolio firms received PE investment before IPO, which is consistent with our observation that Chinese PE market is IPO-driven. Information is missing for PE investment ($PEamount$) and PE deal stake ($PEdeal$) variables because of undisclosed PE deal information.

Table 5.2 Descriptive statistics

This table presents the summary statistics of 364 PE deals from 307 PE-backed listed firms on mainland stock markets from 2000 to 2011. Independent variable *ROA* is measured by net income over total assets. Firm size (*Size*), is measured by the natural logarithm of a firm's total assets. Leverage ratio (*Leverage*), is measured by total debt over total assets. Sales (*Sales*) is defined as sales growth rate, calculated by sales rate in year t+1 minus sales rate in year t divided by sales rate in year t. PE amount (*PE*amount), is the size of PE investment over firm's total assets. The deal stake of PE investment (*PE*deal), measures the percentage of total shares held by PE investor for each transaction. PE round dummy variable (Round_*dum*) equals 1 if this is the first time for PE investment and 0 otherwise; PE type dummy variable (*IPO_dum*) equals 1 if PE investment is made before listing and 0 if the investment is made after listing.

Variable	Obs	Mean	Std. Dev.	Min	Max
ROA	364	0.1217	0.0782	-0.14	0.47
Size	364	20.3693	1.4714	17.94	26.61
Leverage	364	0.4723	0.1787	0.03	1.08
Sales	364	0.3213	0.4216	-0.41	5.32
*PE*amount	348	0.0931	0.0991	0.0003	0.8342
*PE*deal	331	0.1094	0.1225	0.0012	1
Round_*dum*	362	0.7928	0.4058	0	1
IPO_dum	364	0.8516	0.3559	0	1

Data source: (1) *China Stock Market Financial Statements Databases*

(2) *Asian Venture Capital Journal Dataset* (*AVCJ)*

5.3 Empirical results

5.3.1 The impact of PE investment

Table 5.3 reports the impact of PE investment on firm's accounting performance for the whole sample resutls. As far as control variables are concerned, the size of PE investment ($PEamount$) is positively significant with ROA, suggesting that larger size of PE investment helps to improve firm profitability in year t+1. This result confirms hypothesis 2a. Similarly, the PE deal stake ($PEdeal$) variable shows a negatively significant relationship with ROA, which confirms our hypothesis 4d. PE deal stake is an indicator representing the percentage of shares that have passed to outside PE investors. The negative relationship shows that PE investors are not engaged into any corporate governance improvement activities which is consistent with the minority shareholder role of these investors. The PE round dummy ($Round\_dum$) is insignificant, suggesting that whether a previous PE investment is available does not affect the current PE investment. The PE investment before IPO dummy variable (IPO_dum) is positively significant, showing that PE investment before IPO tends to bring in higher profitability. This finding is consistent with the fact that most of our sample firms receive PE investment shortly before going for IPO and they need to have strong operating performance, balance sheet and positive cash flow. For the controlling variables, firm size variable is negatively significant with profitability, which is consistent with findings from Haines (1970) and Shepherd (1972). According to Haines (1970), large firms might have grown beyond the optimum, so large firms would be growing more slowly than smaller firms. This explanation is supported by our sample firms because most of them are listed on new stock boards and are relatively small in firm size. The leverage ratio is also negatively

significant with profitability and confirms our predictions.

Table 5.3 Cross-section OLS on whole sample

This table reports the results of our cross-sectional regressions. Independent variable *ROA* is measured by net income over total assets. Firm size (*Size*), is measured by the natural logarithm of a firm's total assets. Leverage ratio (*Leverage*), is measured by total debt over total assets. Sales (*Sales*) is defined as sales growth rate, calculated by sales rate in year t+1 minus sales rate in year t divided by sales rate in year t. PE amount (*PE*amount), is the size of PE investment over firm's total assets. The deal stake of PE investment (*PE*deal), measures the percentage of total shares held by PE investor for each transaction. PE round dummy variable (Round_*dum*) equals 1 if this is the first time for PE investment and 0 otherwise; PE type dummy variable (*IPO_dum*) equals 1 if PE investment is made before listing and 0 if the investment is made after listing. Industry and year factors are included into modeling. The figures in parentheses are the t-statistics, computed using the robust heteroskedasticity standard error.

	ROA		
	(1)	(2)	(3)
Size	-0.0121	-0.0096	-0.0151
	(-3.21)	(-3.35)	(-3.56)
Leverage	-0.1278	-0.1193	-0.1235
	(-5.22)	(-5.03)	(-4.98)
Sales	0.0090	0.0116	0.0102
	(0.78)	(1.00)	(0.88)
PEamount	0.0062		0.0101
	(1.76)		(2.58)
PEdeal		-0.0142	-0.0505
		(-0.64)	(-1.86)
Round_*dum*	0.0012	0.0044	-0.0505
	(0.13)	(0.48)	(-1.86)
IPO_dum	0.0663	0.0593	0.0678
	(5.75)	(5.41)	(5.48)
Cons	0.2244	0.2815	0.2249
	(3.19)	(4.15)	(3.06)
Industry	*Included*	*Included*	*Included*
Year	*Included*	*Included*	*Included*
Adj R_sq	0.3546	0.3526	0.3556
Obs	347	343	329

Data source: (1) *China Stock Market Financial Statements Databases*

(2) *Asian Venture Capital Journal Dataset* (*AVCJ)*

5.3.2 Robustness check

Previously we have discovered the effect of PE investors on their Chinese portfolio firms and we have proposed some consistent results between the Chinese PE market and the existing literature. In this section, we want to provide further details regarding the effect of PE investment in China. To do this, we carry out four sub-groups of robustness check.

The first sub-group is based on PE-backed firms' listing board. Since the growing PE-backed IPO market was aligned with the setting up of the two new stock boards. We expect PE investments to have different impact on firms from different stock boards. Because most of the new board listed firms receive PE investment before IPO, these firms make use of PE investment to ensure their successful listing process. Consequently, PE investment may play a significant role in new boards' listed firms than main boards' listed firms, as proposed in the hypothesis 5a.

The second group is based on PE investor's different country of origin, that is, whether PE investors are domestic or non-domestic. As shown in Chapter 2, the majority of the PE investors in China are domestic investors, including the government-affiliated PE investors, financial institution-affiliated PE investors, university-affiliated PE investor and corporate PE investors etc. Given that PE investors used to be the experts in a specific industry, we expect that domestic investors have a better understanding of the Chinese market and of the demands of portfolio firms and so can play a more active role than their non-domestic counterparts, as proposed in the hypothesis 5b.

One feature of Chinese listed firms is the state background, namely either the firm is with

a state-related legal person or is affiliated to a SOE (state-owned enterprises). Such firms are commonly found in Shanghai and Shenzhen main stock boards. Although the majority of our sample firms are SMEs and not SOEs, there is still a certain number of firms with state shares in the ownership structure. We want to differentiate these two types of firms in our third sub-group test. We expect PE investment has less impact on firms with state shares, as proposed in the hypothesis 5c.

We also take into account the joint-effect of PE investors, namely the syndicate PE investors, as our last sub-group testing. Chinese PE investors, regardless of whether they are syndicated or not, normally become minority shareholders in their portfolio firms. Therefore, it is questionable whether the syndicated PE investors or a single PE investor has higher impact on portfolio firms. Based on the discussions from chapter 3, we expect syndicated PE investors have significant impact portfolio firms than single PE investors, as proposed in the hypothesis 4a.

For the first subgroup testing, the sample firms are divided according to different board of listing: it equals one if the PE-backed firm is listed on main boards and otherwise if the firm is listed on new boards. The model is the same as in equation 5.1 and results are reported in Table 5.4. With relaxing listing requirements in the newly set up stock boards, the number of firms from new boards is almost three times the number of main boards listed firms, with 256 firms and 76 firms respectively. We find PE amount variable is positively significant for new boards' listed firms but has no significant impact for main boards listed firms. Due to the fact that firms listed on new boards are smaller, the ratio

of PE investment capital inflow can be relatively large. Therefore, the size of PE investment has a positively significant impact for new board listed firms but not for main board listed firms. Smaller firm size also means the entry of external investors can affect the role of dominant shareholders and thus accelerate agency conflict. Accordingly, it is observed that PE deal stake is negatively significant in firm performance for new boards listed firms but insignificant for main boards' listed firms. In sum, we accept hypothesis 5a by concluding that PE investors have significant impact on new board listed firms due to the better understanding of the Chinese market. However, due to the short-term profit intention from new-board listed firms, PE investors have no or less interests in involving into portfolio firm's corporate governance issue. Also the short-term profit incentive may create some conflicts of interest between PE investors and portfolio firms, shown as the negative relationship between PE deal stake and performance measurement.

Table 5.4 Cross-section OLS by listed stock board sub-groups

$y_{it} = 1$ if the PE-backed firm is listed on Shanghai stock main board and Shenzhen stock main board, and 0 if the PE-backed firm is listed on SME and ChiNext new boards. This table reports the results of our cross-sectional regressions. Independent variable *ROA* is measured by net income over total assets. Firm size (*Size*), is measured by the natural logarithm of a firm's total assets. Leverage ratio (*Leverage*), is measured by total debt over total assets. Sales (*Sales*) is defined as sales growth rate, calculated by sales rate in year t+1 minus sales rate in year t divided by sales rate in year t. PE amount (*PEamount*), is the size of PE investment over firm's total assets. The deal stake of PE investment (*PEdeal*), measures the percentage of total shares held by PE investor for each transaction. PE round dummy variable (Round_*dum*) equals 1 if this is the first time for PE investment and 0 otherwise; PE type dummy variable (*IPO_dum*) equals 1 if PE investment is made before listing and 0 if the investment is made after listing. Industry and year factors are included into modeling. The figures in parentheses are the t-statistics, computed using the robust heteroskedasticity standard error.

	ROA Main boards			ROA New boards		
	(1)	(2)	(3)	(4)	(5)	(6)
Size	-0.0033 (-0.76)	-0.0037 (-0.92)	-0.0020 (-0.46)	-0.0107 (-1.62)	-0.0162 (-2.41)	-0.0094 (-1.39)
Leverage	-0.1225 (-3.03)	-0.1083 (-3.20)	-0.1387 (-3.40)	-0.1138 (-3.87)	-0.1214 (-3.78)	-0.0989 (-3.31)
Sales	0.0236 (1.35)	0.0256 (1.53)	0.0250 (1.37)	0.0063 (0.55)	0.0130 (1.03)	0.0106 (0.93)
PEamount	0.0030 (0.09)		-0.0091 (-0.23)	0.1392 (2.03)		0.2548 (3.46)
PEdeal		0.0209 (0.91)	0.0273 (1.01)		-0.0950 (-1.68)	-0.2036 (-3.27)
Round_*dum*	-0.0158 (-1.14)	-0.0163 (-0.92)	-0.0146 (-0.77)	-0.0019 (-0.19)	0.0068 (0.65)	0.0039 (0.37)
IPO_dum	0.0634 (5.55)	0.0606 (5.76)	0.0668 (5.84)	0.0147 (0.38)	0.0141 (0.34)	0.0322 (0.82)
Cons	0.1868 (1.87)	0.1772 (1.80)	0.1596 (1.55)	0.3213 (2.05)	0.4424 (2.80)	0.2793 (1.77)
Industry	*Included*	*Included*	*Included*	*Included*	*Included*	*Included*
Year	*Included*	*Included*	*Included*	*Included*	*Included*	*Included*
Adj R_sq	0.5159	0.5230	0.5478	0.2391	0.2090	0.2689
Obs	76	83	73	271	260	256

Data source: (1) *China Stock Market Financial Statements Databases*

(2) *Asian Venture Capital Journal Dataset* (*AVCJ)*

For the second subgroup testing, we separate our sample firms by whether the PE investment is made by domestic or non-domestic investors, reported in Table 5.5. As expected, we find PE amount is positively significant and PE deal stake is negatively significant for the domestic investor group but insignificant for the non-domestic group. This observation can be attributed to domestic investors' better understanding of the Chinese market and the demand for PE portfolio firms. Even though domestic investors are younger on average than their non-domestic counterparts (as shown in Panel 5 Table 2.4), they have developed a better network in China based on *guanxi* and past experience. For example, based on their reputation and connection with accounting and law firms, domestic investors can provide better paper work for IPO application and hence increase CSRC listing rate (Zhang and Li., 2012). Despite the fact that non-domestic investors have longer operation history and have raised larger funds, they need a better understanding of the Chinese portfolio firms before making an investment. Consequently, they have the strategy of concentrating their funds on a small number of PE investments which is consistent with our observation from Panel 4 Table 2.4. Taken together, we accept hypothesis 5b, stating that domestic PE investors have significant impact on portfolio firms than their non-domestic competitors.

Table 5.5 Cross-section OLS by PE investor sub-groups

$y_{it} = 1$ if PE investor is from domestic, and 0 if the PE investor is non-domestic (including HongKong). This table reports the results of our cross-sectional regressions. Independent variable *ROA* is measured by net income over total assets. Firm size (*Size*), is measured by the natural logarithm of a firm's total assets. Leverage ratio (*Leverage*), is measured by total debt over total assets. Sales (*Sales*) is defined as sales growth rate, calculated by sales rate in year t+1 minus sales rate in year t divided by sales rate in year t. PE amount (*PEamount*), is the size of PE investment over firm's total assets. The deal stake of PE investment (*PEdeal*), measures the percentage of total shares held by PE investor for each transaction. PE round dummy variable (*Round_dum*) equals 1 if this is the first time for PE investment and 0 otherwise; PE type dummy variable (*IPO_dum*) equals 1 if PE investment is made before listing and 0 if the investment is made after listing. Industry and year factors are included into modeling. The figures in parentheses are the t-statistics, computed using the robust heteroskedasticity standard error.

	ROA Domestic investors			ROA Non-domestic investors		
	(1)	(2)	(3)	(4)	(5)	(6)
Size	-0.0093	-0.0134	-0.0092	-0.0098	-0.0113	-0.0105
	(-2.15)	(-3.63)	(-2.08)	(-2.19)	(-2.88)	(-2.44)
Leverage	-0.1117	-0.1093	-0.1000	-0.1679	-0.1604	-0.1760
	(-4.28)	(-4.51)	(-3.79)	(-3.47)	(-3.82)	(-3.68)
Sales	0.0193	0.0235	0.0216	0.0071	0.0083	0.0081
	(1.61)	(2.02)	(1.77)	(1.04)	(1.19)	(1.19)
PEamount	0.1077		0.1871	0.0304		0.0277
	(1.77)		(2.81)	(0.83)		(0.72)
PEdeal		-0.0297	-0.0978		-0.0139	-0.0176
		(-0.85)	(-2.15)		(-0.43)	(-0.47)
Round_*dum*	0.0031	0.0094	0.0054	-0.0489	-0.0485	-0.0483
	(0.33)	(0.97)	(0.55)	(-2.01)	(-2.04)	(-1.96)
IPO_dum	0.0727	0.0686	0.0794	0.0746	0.0624	0.0663
	(4.66)	(4.68)	(4.67)	(5.08)	(4.63)	(4.14)
Cons	0.2404	0.3356	0.2378	0.3889	0.4109	0.4147
	(2.46)	(3.97)	(2.32)	(3.89)	(4.34)	(4.30)
Industry	*Included*	*Included*	*Included*	*Included*	*Included*	*Included*
Year	*Included*	*Included*	*Included*	*Included*	*Included*	*Included*
Adj R_sq	0.3373	0.3310	0.3527	0.7029	0.6988	0.7120
Obs	295	289	278	52	54	51

Data source: (1) *China Stock Market Financial Statements Databases*

(2) *Asian Venture Capital Journal Dataset* (*AVCJ)*

In the third testing group, we separate firms by whether they have state background, indicated by where state ownership exists in the firm. The results are reported in Table 5.6. From the table, we find PE amount is positively significant and PE deal stake is negatively significant in the non-state group. Similar results are not found for firms with state ownership. In addition, it is observed that there are four times as many non-state as state-backed firms. This finding is consistent with the nature of our sample firms, most of which are private, small and medium sized firms listed on two new stock boards. However, due to the size of SME firms and the lack of mechanism for monitoring between owners and managers, there could be some possible conflicts between PE investors and the insiders. The disagreement may hurt firm performance, leading to the negatively relationship between PE deal stake and firm operation. For state-backed firms, the motivation for receiving PE investment can be different from SME motivation. For example, some of the state enterprises regard domestic listing as the first step to multi-listing on the international IPO market in the long-term (Humphery-Jenner and Suchard, 2013), which confirms the insignificant impact from two PE measurements. Taken together, we confirm hypothesis 5c by stating that PE investors have significant impact on non-state-backed portfolio firms than on firms with state ownership.

Table 5.6 Cross-section OLS by state-ownership sub-groups

$y_{it} = 1$ if PE portfolio firm is with state-ownership, and 0 if PE portfolio firm is without state-ownership. This table reports the results of our cross-sectional regressions. Independent variable *ROA* is measured by net income over total assets. Firm size (*Size*), is measured by the natural logarithm of a firm's total assets. Leverage ratio (*Leverage*), is measured by total debt over total assets. Sales (*Sales*) is defined as sales growth rate, calculated by sales rate in year t+1 minus sales rate in year t divided by sales rate in year t. PE amount (*PEamount*), is the size of PE investment over firm's total assets. The deal stake of PE investment (*PEdeal*), measures the percentage of total shares held by PE investor for each transaction. PE round dummy variable (*Round_dum*) equals 1 if this is the first time for PE investment and 0 otherwise; PE type dummy variable (*IPO_dum*) equals 1 if PE investment is made before listing and 0 if the investment is made after listing. Industry and year factors are included into modeling. The figures in parentheses are the t-statistics, computed using the robust heteroskedasticity standard error.

	ROA State-ownership			ROA Non-state ownership		
	(1)	(2)	(3)	(4)	(5)	(6)
Size	-0.0134	-0.0091	-0.0119	-0.0067	-0.0106	-0.0058
	(-2.72)	(-1.95)	(-2.44)	(-1.68)	(-3.00)	(-1.45)
Leverage	0.0494	0.0091	0.0434	-0.1459	-0.1492	-0.1344
	(1.17)	(0.25)	(1.00)	(-5.18)	(-5.33)	(-4.74)
Sales	0.0618	0.0673	0.0610	-0.0034	-0.0002	-0.0020
	(1.91)	(2.10)	(1.79)	(-0.42)	(-0.03)	(-0.26)
PEamount	-0.0557		-0.0575	0.1252		0.2191
	(-1.57)		(-1.66)	(2.11)		(3.39)
PEdeal		0.0535	0.0629		-0.0119	-0.0868
		(0.80)	(0.76)		(-0.49)	(-2.52)
Round_*dum*	0.0029	-0.0045	0.0018	0.0067	0.0118	0.0077
	(0.09)	(-0.14)	(0.05)	(0.72)	(1.26)	(0.81)
IPO_dum	0.0773	0.0750	0.0866	0.0789	0.0731	0.0876
	(2.45)	(2.23)	(2.10)	(4.41)	(4.21)	(4.62)
Cons	0.3030	0.2102	0.2569	0.1865	0.2768	0.1650
	(2.75)	(1.61)	(2.00)	(2.12)	(3.46)	(1.84)
Industry	*Included*	*Included*	*Included*	*Included*	*Included*	*Included*
Year	*Included*	*Included*	*Included*	*Included*	*Included*	*Included*
Adj R_sq	0.5036	0.4850	0.5051	0.3853	0.3671	0.4100
Obs	55	60	54	292	283	275

Data source: (1) *China Stock Market Financial Statements Databases*

(2) *Asian Venture Capital Journal Dataset* (*AVCJ)*

In the last sub-group, we differentiate firms by whether they have a single PE investor or syndicated PE investors, reported in Table 5.7. We observe similar results from previous models for portfolio firms with a single PE investor, in which PE amount is positively significant and PE deal stake is negatively significant. This is consistent with our expectation that a concentrated ownership has more direct effect on the target firm. The syndicated PE investor group does not show such results, which may be explained by the diluted number of shares obtained by each investor or the weak joint effect due to the co-investment choice between different investors. These results are in contrast to both Guo and Jiang (2013) and Hua et al (2016) by showing syndicated investors do not have significant impact on portfolio firms. Our understanding of the inconsistent results can be explained by the different sample firms that have been used. In both studies, the authors mainly focus on VC investors while in our sample, both VC and non-VC investors are included. But in our sample we focus on PE rather than VC investors. As a result, we reject the hypothesis by revealing syndicated PE investors have insignificant impact on portfolio firms.

Table 5.7 Cross-section OLS by number of PE investors sub-groups

$y_{it} = 1$ if PE portfolio firm is with single PE investors, and 0 if PE portfolio firm is without syndicated PE investors. This table reports the results of our cross-sectional regressions. Independent variable *ROA* is measured by net income over total assets. Firm size (*Size*), is measured by the natural logarithm of a firm's total assets. Leverage ratio (*Leverage*), is measured by total debt over total assets. Sales (*Sales*) is defined as sales growth rate, calculated by sales rate in year t+1 minus sales rate in year t divided by sales rate in year t. PE amount (*PE*amount), is the size of PE investment over firm's total assets. The deal stake of PE investment (*PE*deal), measures the percentage of total shares held by PE investor for each transaction. PE round dummy variable (Round_*dum*) equals 1 if this is the first time for PE investment and 0 otherwise; PE type dummy variable (*IPO_dum*) equals 1 if PE investment is made before listing and 0 if the investment is made after listing. Industry and year factors are included into modeling. The figures in parentheses are the t-statistics, computed using the robust heteroskedasticity standard error.

	ROA Single investor			ROA Multiple investors		
	(1)	(2)	(3)	(4)	(5)	(6)
Size	-0.0047	-0.0067	-0.0092	-0.0138	-0.0153	-0.0105
	(-1.23)	(-1.83)	(-2.08)	(-2.83)	(-3.34)	(-2.44)
Leverage	-0.1137	-0.1061	-0.1000	-0.1004	-0.1652	-0.1760
	(-4.07)	(-4.02)	(-3.79)	(-2.34)	(-3.38)	(-3.68
Sales	0.0371	0.0387	0.0216	-0.0103	-0.0041	0.0081
	(2.85)	(2.98)	(1.77)	(-1.46)	(-0.56)	(1.19)
PEamount	0.0671		0.1871	0.1720		0.0277
	(1.27)		(2.81)	(1.86)		(0.72)
PEdeal		-0.0048	-0.0978		-0.0161	-0.0176
		(-0.14)	(-2.15)		(-0.35)	(-0.47)
Round_*dum*	-0.0061	-0.0009	0.0054	0.0111	0.0146	-0.0483
	(-0.51)	(-0.07)	(0.55)	(0.82)	(1.03)	(-1.96)
IPO_dum	0.0713	0.0651	0.0794	0.0123	0.0191	0.0663
	(5.33)	(5.14)	(4.67)	(0.36)	(0.53)	(4.14)
Cons	-0.1776	0.2154	0.2378	0.3551	0.4120	0.4147
	(-0.23)	(2.53)	(2.32)	(0.004)	(3.24)	(4.30)
Industry	*Included*	*Included*	*Included*	*Included*	*Included*	*Included*
Year	*Included*	*Included*	*Included*	*Included*	*Included*	*Included*
Adj R_sq	0.3675	0.3684	0.3527	0.4380	0.4013	0.7120
Obs	233	237	278	113	105	51

Data source: (1) *China Stock Market Financial Statements Databases*

(2) *Asian Venture Capital Journal Dataset* (*AVCJ)*

5.3.3 The persistence of PE impact on portfolio firms

In the previous sections, we focus on the impact of PE investment (in year *t*) on firm performance (in *t+1*) and find out significant impact on portfolio firms. In this section, we are curious to know about the persistence of PE impact, which is stated in hypothesis 5d. To understand the evolution of portfolio firm performance, we collect post-PE firm performance information for variables in equation (5.1). For ROA, information is collected in year *t+2* and *t+3*, while the information for firm size, leverage and sales growth are collected for year *t+1* and *t+2*. The performance indication indices are compared between the initial year and the year after. Table 5.8 provides this preliminary analysis of the persistence of the PE portfolio firm performance. We find the entry of PE investment instantly increases ROA in the year after PE investment but the figures drop in subsequent years. The corresponding *t* test indicates that ROA experience a significant increase in year *t+1*, but then drop afterwards in year *t+2* and year *t+3*. For firm performance controlling variables, firm size variable rises while both leverage and sales growth variable fall in the long run. Similar *t* test statistics provide significant results for each controlling variable. Considering that most of our sample firms become listed in *t+2* and *t+3* period, the increased firm size is consistent with the gradual development of the firm after or getting closer to listing. In addition, the decreased leverage ratio can be explained by PE financing overtaking debt financing in these firms. We then repeat the above equation (5.1) to test PE impacts in the long run, reported in Table 5.9. It is observed that PE investment has no significant impact in *t+2* and *t+3* time period, suggesting a short-run orientation of Chinese PE investment. Further, to explain the insignificant long term performance, we cannot neglect the general economic environment in China. The

Chinese stock market has been in a downward spiral since 2009. At the same time, the global financial crisis has a great impact on export related industries in China, in fact on most manufacturing firms. This manufacturing industry provided most of our sample firms (shown in Table 2.4, Panel 6). Taken together, Table 5.9 suggests that PE investment does not change firm performance significantly in the long run. Combining the previous results, we conclude that PE investment in Chinese firms is mainly driven by short term profitability purpose and PE investors are speculative in the Chinese market.

Table 5.8 Time-series firm performance comparison of investee firms

The numbers in the first row are mean values of *ROA*. Year t is defined as the PE investment year. T test is applied to mean values respectively. *ROA* is measured by net income over total assets. Firm size (*Size*), is measured by the natural logarithm of a firm's total assets. Leverage ratio (*Leverage*), is measured by total debt over total assets. Sales (*Sales*) is defined as sales growth rate, calculated by sales rate in year t+1 minus sales rate in year t divided by sales rate in year t.

	Year 0 (1)	Year 1 (2)	Year 2 (3)	Year 3 (4)	ΔVAR_1 (2)-(1)	ΔVAR_2 (3)-(2)	ΔVAR_3 (4)-(3)
ROA	0.0982	0.1217	0.0724	0.0596	0.0235 (7.3903)	-0.0493 (-12.4731)	-0.0129 (-4.708)
Size	20.3693	20.6242	21.2681	---	0.2532 (10.2787)	0.6886 (25.7109)	---
Leverage	1.6898	1.072	0.6351	---	-0.6196 (-0.3101)	-0.4513 (-13.1535)	---
Sales	0.3213	0.2851	0.1713	---	-0.037 (-1.2832)	-0.1367 (-3.8643)	---
Obs	364	364	364	364			

Data source: *China Stock Market Financial Statements Databases*

Table 5.9 The impact of PE investment in the long-run

Independent variable *ROA* is collected for T+3 and T+2 time period where *t* is the year in which PE investment took place. Control variables include: firm size (*Size*), Leverage ratio (*Leverage*), and Sales (*Sales*). These three variables are collected for T, T+1 and T+2 time period where T is the year of PE investment. Testing variables include PE amount (*PE*amount), PE deal stake (*PE*deal), PE round dummy variable (Round_*dum*) and PE type dummy variable (*IPO_dum*). Industry and year factors are included in modeling. The figures in parentheses are the t-statistics.

		ROA *T*+3 (1)	*ROA* *T*+2 (2)
Size	$t+2$	-0.0079 (-1.28)	
	$t+1$	0.0101 (1.48)	-0.0144 (-2.36)
	t	0.0019 (0.34)	0.0104 (1.73)
Leverage	$t+2$	-0.0298 (-1.58)	
	$t+1$	-0.0115 (-0.48)	-0.0141 (-0.56)
	t	-0.0260 (-1.16)	-0.0462 (-1.67)
Sales	$t+2$	0.0043 (1.09)	
	$t+1$	0.0151 (2.49)	0.0022 (0.36)
	t	0.0118 (1.07)	0.0107 (0.83)
PEamount		-0.0036 (-1.37)	-0.0001 (-0.03)
PEdeal		0.0383 (1.68)	0.0003 (0.01)
Round_dum		0.0073 (1.48)	0.0132 (1.87)
IPO_dum		0.0185 (1.75)	0.0180 (1.79)
Cons		0.0182 (0.27)	0.1452 (2.16)
Industry		*Included*	*Included*
Year		*Included*	*Included*
Adj R_sq		0.2129	0.1389
Obs		320	328

Data source: *China Stock Market Financial Statements Databases*

5.4 Conclusion

This chapter provides the impact of PE investment on its portfolio firms based on the existing literature and adds new evidence to Chinese PE literature. Using a sample of 364 PE deals from 307 Chinese listed firms between 2000-2011, the following findings are reached. First of all, we confirm that the inflow of PE investment leads to better firm performance in the short run, which seems to be consistent with the financing role of PE investment. Although PE investors normally perform as the minority shareholder, the entry of PE investors leads to a negative relationship between PE deal stake and firm performance. Secondly, by expanding our sample period, we examine PE impact in the long-run and observe no evidence of PE investment's impact in the long-run. Considering that most of the PE investment happened shortly before IPO, we speculate that such PE investment is with short-term profit orientation which aims to exit after IPO with excessive returns. These initial results suggest a speculation problem in Chinese PE market. We will carry on this discussion in chapter 6. Last but not least, we find some characteristics of different PE investors and PE portfolio firms: (1) PE-backed portfolio firms' listing board provides information by revealing the trends and the orientation of the Chinese PE market. The setting up of new stock boards, SME and ChiNext, provides the chance for PE-backed firms to go listing. We conclude that the current booming PE market is largely IPO driven, which provides consistent evidence that PE investment has significant impact in new board listed firms. (2) Investors' country of origin reveals the nature of PE investors. By examining different investment strategy and impact, we find that the majority of PE investment comes from domestic PE investors. Although the domestic investors are young and with limited past experience on average, they have a

better understanding of the Chinese market than the non-domestic competitors. (3) Since state-owned firms commonly exist in the Chinese market, the subgroup PE-backed firms with state-ownership can tell us the different role of PE investors in different firms, which is beneficial in understanding the advantage as well as the limitation of PE investments in their portfolio firms. We find firms with state-ownership are not affected by PE investment. This finding reveals the potential alternative purpose for firms with state-ownership to receive PE investment. (4) We carry out the sub-group testing based on whether the PE investment is made by single investor or syndicated investors. Our empirical results support the assumption that a single PE investor with more concentrated ownership control of portfolio firms can have higher impact than firms with multiple PE investors.

Existing studies based on mature market evidence highlight the governance role of PE investment, which reduces agency conflicts between shareholders and managers (Wright et al., 2009). In addition, PE investment can release financial constraints faced by portfolio firms by making direct investment into these firms (Brown and Floros, 2012). However, these conclusions do not seem to match the Chinese case. In this chapter, we analyze the impact from PE investment on Chinese listed portfolio firms in a systematic way. Most importantly, we confirm there is no corporate governance from PE investor in Chinese portfolio firms. Instead, the inflow of short-term profit driven PE funds may cause different interests to the existing shareholder which may lead to a negative impact on firms' profitability performance. Especially, this negative impact exists in firms which has a low level of corporate governance such as a non-state-backed firms or firms listed

on new boards (the SME board and the ChiNext board). Another significant impact from PE investment is the boost of accounting performance after the inflow of PE funds, which is consistent with the fact the PE investors help with the IPO listing process. All together, we suggest the speculation behaviour of PE investors.

Chapter 6 Private Equity Investment and IPO underpricing in China[34]

6.1 Introduction

IPO underpricing is defined as the positive return that a shareholder can achieve when a newly publicly-listed share is bought at its offering price and sold at its first day closing price. IPO underpricing is commonly found in both developed and developing counties but high underpricing is more commonly discovered in the latter (Loughran et al., 1994). The existence of asymmetric information decreases the likelihood for potential investors making correct prediction on the real value of the firm and thus leads to underpricing. In the standard literature, several factors have been indicated to help reduce high underpricing, such as the reputation of the underwriter (Beatty and Ritter, 1986). Among these factors, the entry of Private Equity (PE) investment is indicated as playing a significant role in lower underpricing. On the one hand, PE investors play the monitoring role (Barry et al., 1990) and the certification role (Megginson and Weiss., 1991), which help to lower the asymmetric information problem. On the other hand, PE investment may lead to lower underpricing according to the grandstanding hypothesis (Gompers, 1995), which states that young PE investors would rather undertake the cost of IPO underpricing (leaving the money 'on the table') to build up their reputation.

Previous studies on Chinese IPOs have shown a much higher underpricing ratio compared to other developing markets. According to Ritter (2003), the average underpricing on the Chinese market was as high as 256.9% from 1996-2000. This high Chinese IPO

[34] This chapter is based on a working paper co-authored with Dr. Hong Bo.

underpricing is explained by the high asymmetric information and the IPO listing regulations in the Chinese stock market, including the regulatory underpricing (Gannon and Zhou, 2008; Tian, 2011); the 'Winner's curse' problem (Yu and Tse, 2006); the underwriters' reputation effect (Su and Brookfield, 2013) and the strategic signaling effect of the issuer (Su and Fleisher, 1999).

A large amount of capital has flowed into China's booming Private Equity market. In 2013, China is already the third-largest market in the world with US$ 47 billion available for investment, behind the UK with US$ 76 billion and the US with $464 billion. Especially after the setting up of the SME board in 2005 and the ChiNext board in 2009, IPO has become the most populated exit channel for PE investors. To date, more than one third of the IPOs listed on these two boards are backed by PE investment. In contrast to the populated PE-backed IPO market in China, we have found very few studies that examine the IPO underpricing for PE-backed IPOs. The only two studies we have found so far on this topic are Jiang et al (2014) and Tan et al (2013). We will review these two studies in section3.

In this chapter, we investigate how PE-backed IPOs differ from non PE-backed IPOs in underpricing. We examine a sample of 1301 Chinese IPOs over the period 2000-2011, which includes 295 PE-backed IPOs. We find PE investors in the Chinese market play the certification role, which seems to be consistent with the general literature evidence (Megginson and Weiss., 1991; Barry et al., 1990; Jiang et al., 2014). However, we argue that, even if a PE investment is negatively related to IPO underpricing, the result may not

be attributed only to the monitoring/certification explanation. This is because, if lower underpricing happens due to the entry of PE investors, then other investors who experience a smaller IPO discount tend to believe that the entry of PE investors helps to improve firm performance. As a result, there must be some mechanisms through which PE investors can improve firm performance. The possible mechanisms include: the financing role of PE investment, the governance role through PE investment, and the signaling effect based on the reputation of PE investors. However, by setting up different testing variables for each possible mechanism, our test results show none of the mechanisms can explain lower underpricing for PE-backed IPOs. Hence, we argue that the certification/monitoring role fails to explain the Chinese IPO underpricing. Our results further show that PE-backed IPOs listed on China's two newly established stock market boards, namely the SME board and the ChiNext board, experience lower IPO underpricing. Considering firms listed on these two stock boards are normally young, small, from high-tech sectors, lack of bank financing sources and with lower corporate governance level, the lower underpricing may be caused by the speculation behaviour of PE investors, especially for IPOs listed on the two new stock boards. The reason is that due to the nature of these firms, PE investors have less incentive to become involved in corporate governance operation and their investments aim for short term profit. As a result, the PE-backed IPOs set up higher offering prices than non-PE backed IPOs and can be provided with higher profits via IPO exit.

This study contributes to the existing literature in the following aspects. Firstly, based on general Chinese IPO studies, we make an explicit connection between the Chinese IPO

market and the Chinese PE market which has hardly been studied before. This is because IPOs have become the most welcomed exit channel for PE investment, especially after the setting up of the SME board in 2004 and the ChiNext board in 2009. Our study also distinguishes itself from a few similar studies in the following aspects: (1) instead of focusing on a specific type of PE investment, we take into account all types of PE investment taking place in China between 2001 and 2011. In previous studies, for example Tan et al (2013) study 273 IPOs listed on the SME board between May 2004 and December 2008 by including only 59 VC-backed IPOs and Jiang et al (2014) use 419 IPOs on the two new stock markets during June 2004-March 2010 including only 153 VC-backed IPOs. In our study, we examine a sample of 1301 IPOs listed on the Chinese domestics markets including 259 PE-backed IPOs. (2) Previous studies focus on IPOs listed on Shanghai and Shenzhen stock main boards. Our sample firms come from both main stock boards and new stock boards. Moreover, the majority of our IPOs come from new stock boards which can provide new insights on the IPO operation in China. (3) Although previous studies have provided some consistent results to general PE findings, there is a lack of explanation for the nature of the Chinese stock market and Chinese IPOs. Moreover, these studies do not examine other theories that may be a direct cause of lower underpricing in China, such as, signaling effect, governance effect and the financing role of PE investment. In sum, instead of providing consistent results for the existing literature, we provide a new mechanism which helps to explain the lower underpricing in China.

This chapter is organized as follows: in section 2, the background information regarding Chinese stock market and its relationship with the Chinese PE market are introduced. In

section 3, a review of the literature in the context of IPO underpricing and underperformance is provided. The model and data on IPO underpricing and underperformance are presented in section 4 and section 5 respectively. Section 6 concludes.

6.2 Institutional background

In December 1990, the Shanghai Securities Exchange (SSE) was set up and in April of the following year the Shenzhen Stock Exchange (SZSE) was founded. To solve financing difficulties for small and medium sized firms, the SME board was established in 2005 followed by the ChiNext board in 2009. The ChiNext board is regarded as the NASDAQ board in China. The setting up of the two new stock boards stimulated the Chinese IPO market as well as the PE market. In this section, we analyze the features for both the Chinese IPO market and the Chinese PE market. We also provide integration on how these features affect underpricing.

An important feature of the heavily intervened Chinese IPO market is the quota system, which was effective between 1993 and 2000. Under this system, the quota was first determined by the State Council Securities Committee, the State Planning Commission, and the People's Bank of China (PBC). The quota was then allocated to different provinces and municipalities, according to which local authorities selected IPOs based on firms' accounting performance and the objectives of the local economic development plan. It was not until 2001 when the first non-quota IPO was listed in the Chinese stock market. The quota system has resulted in high IPO first day initial returns as a result of lack of supply in the stock market. Moreover, because the IPO quota was largely allocated to SOEs, privately-owned Small and Medium sized Enterprises (SMEs) in China had few opportunities to be listed in the stock market during the quota system period. To solve SMEs financing problems, China set up the Small and Medium sized Enterprises board (hereafter the SME board) in the Shenzhen stock exchange in May 2004. The listing

requirements for the SME Board are similar to those of the two main boards apart from the size of the IPO. For example, firms issuing more than 80 million shares can be listed on the two main boards, whereas firms issuing less than 50 million shares have to apply for IPOs on the SME board. The ChiNext board was established in 2009. According to the CSRC, the ChiNext board was designed for high growth and high-tech firms as well as firms in the new economy, new services, new agriculture, new energy, new material and new business mode. In addition, the requirements for listing on the ChiNext board are less restrictive than on the two main boards. For example, firms applying for IPOs on the ChiNext board need only meet the requirement concerning profitability and cash flow in the past one or at most two years, whereas firms have to meet profitability requirements for the past three consecutive years if they want to be listed on the two main boards and the SME board. A comparison of listing requirements among main boards, the SME board and the ChiNext board can be found in Chapter 2. The establishment of new stock boards has provided wider opportunity for IPO listing (Talmor and Vasvari, 2011). Since IPO listing is regarded as the most efficient exit channel for PE investment, the setting up of new boards has helped to stimulate the development of the Chinese PE market.

Another feature of the Chinese IPO market is the control of IPO pricing, which results from the quota system. The CSRC required that the offering price should be set according to the following general formula: offering price = EPS*P/E, where EPS refers to earnings per share and P/E refers to the price-to-earnings ratio. Chinese administrative intervention in the IPO pricing system can be divided into three stages. The first stage covers the period from 1996 to 2001. Before 1996, EPS was the forecasted earnings per share and the P/E

ratio was fixed between 13 and 15 by the regulator. From 26 December 1996 onwards, the CSRC required that EPS should be measured by the average of the firm's realized earnings per share in the past three years. On 10 September 1997, the CSRC modified the IPO pricing formula to: IPO price = EPS*P/E, where EPS = 0.7*EPS in the year before the IPO + 0.3*Forecasted EPS in the IPO year. The range of P/E was decided by the CSRC. Moreover, on 17 March 1998, the CSRC further changed the IPO pricing formula to: IPO price = EPS*P/E, where EPS= EPS = Forecasted Earnings/(Total number of shares before IPO + Number of IPO shares*(12-month)/12)[35]. In the meantime, the range of P/E was still decided by the CSRC. In March 1999, the CSRC began to allow issuers and underwriters to set a range of initial offering prices subject to CSRC approval, which is an earlier attempt of applying the 'book-building' system. The IPO issuing size was still under the instruction of 'the Quota System' at that moment. The second stage of the IPO pricing system development in China covers the period from 2001 to 2004. In 2001, the 'Quota System' was officially terminated and a 'Sanction System' started to apply. Under the Sanction System underwriters recommend new issuers to the CSRC for approval and the issuing size of IPOs was no longer restricted. However, the P/E ratio was still restricted to below 20. The third stage of the Chinese IPO pricing system refers to the application of the 'book-building' system which officially took effect after 2005. Under the book-building system, the issuer and the lead underwriter first set a price range by soliciting an initial price based on quotes from institutional investors. The subscriptions from institutional investors help to decide the final offering price. A maximal 50 percent of IPO shares are allocated to offline institutional investors, the rest

[35] Where 'month' is the month when IPO is offered.

are sold to the public via an online system. The offering price is the same for both institutional investors and public investors (Tan et al., 2013). As a result, heavy administrative intervention in setting IPO offering price leads to the potential high underpricing problem in the Chinese stock market.

There are some other characteristics of the Chinese stock market that can affect IPO underpricing. For example, an IPO lottery system was established in August 1992 to control for the share distribution in the primary market. Under this system, funds had to be deposited in an electronic trading account. If the account was chosen to be allocated with new IPO shares, then the owner of this account won a lottery in successfully purchasing some IPO shares at offering prices. The winning lottery ratio is the proportion of the successful subscription to the total subscription of new shares. This system was modified in May 2002, to require that the subscribers who participate in the lottery system have already held at least 10000 RMB worth of shares in the secondary market. The purpose of this modification was to curb speculative behaviour in subscribers' purchasing of new shares.[36] As a result, a low lottery ratio suggests that the demand for IPO shares will be higher in the second market, which will push up the first day trading price of the IPO.

Another feature of the Chinese IPO market is the regulation of waiting days, defining as the number of days between the IPO offering day and its first trading day. After making an initial offering to the public, the IPO firm has to wait for further authorization from the

[36] Available from Shenzhen stock exchange document: http://www.szse.cn/main/en/AboutSZSE/SZSENews/SZSENews/39751017.shtml

CSRC before the shares can actually be traded in the secondary stock market. This waiting period is normally around two months (Cedergren, 2014). The long waiting period is likely to increase uncertainty for investors leading to higher IPO underpricing.

The Chinese PE market has made its major development along with the establishment of two new stock boards after 2005. As a result, the Chinese PE market contains some unique features absent from other mature PE markets and these features have implications for IPO underpricing. Firstly, the Chinese PE market is heavily driven by IPOs. According to the Asian Venture Capital Journal (AVCJ) dataset, the number of PE deals from Pre-IPO type accounts for 79.01% of all PE deals in the Chinese PE market in the period between 2000 and 2011. Along with the booming stock market and the setting up of new stock boards in 2000, PE-backed IPOs make up 23% and 41% of total IPOs from the SME board and the ChiNext board respectively by the end of 2011. The Pre-IPO PE portfolio firms often use PE investment as a certification to pass through the IPO approval process (Zhang and Li, 2012). Secondly, PE investors in China normally become minority rather than majority shareholders and these investors have less interests in improving corporate governance in portfolio firms. These PE investors made investments before IPO, helped with the passing rate from CSRC and exited after the listing. The role of a minority shareholder provides limited space for PE investors to help with corporate governance improvement and other value-added activities.

In Table 6.1, we demonstrate the development of the Chinese PE-backed IPO market from 2001-2011. As shown in Panel 1, the IPO market maintained steady growth until 2007, at which point growth accelerated following the setting up of two new boards. The number of both PE-backed IPOs and non-PE backed IPOs peaked in 2010 with 231 and 113 newly

listed firms respectively. In 2011, PE-backed IPOs accounted for two thirds of total IPOs in the China IPO market. Panel 2 shows the capital raised on the first day of IPO. Both PE-backed and non-PE backed IPOs showed significant capital increase after 2007 which is consistent with the observations in Panel 1. We notice that the capital raised from PE-backed IPOs exceed their non-PE peers for the first time in 2008 with capital raised worth 54.49 million RMB. However, a sharp decrease was found in the following year which can be attributed to the Chinese stock bubble bursting in 2007. In Oct 2009, the setting up of the ChiNext board and the first batch of high-tech firms trading on ChiNext, helped to recover the Chinese IPO market. In the latest Panel, the annual IPO performance is reported. We observe PE-backed IPOs have lower underpricing than non-PE backed IPOs on average. Accompanied by the booming Chinese stock market, the highest underpricing period was found in 2007 and 2008. After the setting up of new boards, underpricing for PE-backed IPOs exceeded the other group in 2009 and 2011. The above results indicate PE investment has been largely evolved into the Chinese stock market. The booming stock market and the setting up of new boards have attracted more PE investors into the stock market. The hot PE-backed IPO market implies the potential for speculative behaviour in China.

Table 6.1 PE-backed vs. Non-PE backed IPO

This table shows the development of IPOs in China between 2001 and 2011. We do not exclude those companies that delisted from the stock market since we only focus on IPO performance.

Panel 1 Distributions of IPO transactions by year, 2001-2011

Year	Non-PE backed IPO	Percentage (%)	PE-backed IPO	Percentage (%)	Total number of deals
2001	75	7.46	1	0.10	76
2002	68	6.77	1	0.10	69
2003	63	6.27	2	0.20	65
2004	95	9.45	5	0.50	100
2005	14	1.39	1	0.10	15
2006	58	5.77	6	0.60	64
2007	94	9.35	21	2.09	115
2008	61	6.07	16	1.59	77
2009	53	5.27	44	4.38	97
2010	231	22.99	113	11.24	344
2011	193	19.20	86	8.56	279
Sum	1005		296		1301

Data source: *Shanghai Stock Exchange and Shenzhen stock exchange market statistics.*

Panel 2 Distributions of IPO capital raised, 2001-2011

Year	Total amount raised by non-PE backed IPO (Million RMB)	Percentage (%)	Total amount raised by PE-backed IPO (Million RMB)	Percentage (%)	Total amount raised
2001	49.15	3.82	11.82	3.11	60.97
2002	40.33	3.14	0.28	0.07	40.61
2003	39.31	3.06	0.53	0.14	39.84
2004	36.81	2.86	1.02	0.27	37.83
2005	5.60	0.44	0.16	0.04	5.76
2006	70.67	5.50	5.74	1.51	76.41
2007	204.46	15.91	51.32	13.51	255.78
2008	51.90	4.04	54.49	14.34	106.39
2009	135.06	10.51	30.76	8.10	165.82
2010	257.96	20.07	128.56	33.84	386.52
2011	394.09	30.66	95.24	25.07	489.33
Sum	1285.34		379.92		1665.26

Data source: *CSMAR China Stock Market Trading Database*

Panel 3 underpricing for IPOs, 2001-2011

Year	Non-PE backed IPO			PE-backed IPO		
	MAAR_SH (%)	MAAR_SZ (%)	IR (%)	MAAR_SH (%)	MAAR_SZ (%)	IR (%)
2001	141.05	141.07	139.59	17.00	17.00	3.32
2002	134.24	134.24	132.53	148.14	148.14	141
2003	71.34	71.34	71.05	151.03	151.03	155.25
2004	73.44	71.78	70.34	72.80	72.06	66.26
2005	48.56	49.31	43.44	79.12	78.27	68.70
2006	87.95	84.71	94.44	62.76	67.55	75.34
2007	191.12	189.93	200.79	198.74	200.49	208.03
2008	125.71	125.46	118.35	114.50	115.69	101.58
2009	71.89	70.69	72.43	78.15	76.42	78.71
2010	42.37	42.29	41.07	43.84	43.77	43.76
2011	25.53	23.51	23.43	15.47	15.83	14.74
Sum	80.33	79.88	80.27	57.48	57.57	57.35

Data source: *CSMAR China Stock Market Trading Database*

6.3 Related Literature

6.3.1 Theories on IPO underpricing

In the standard literature developed in mature market systems, the most commonly used theory explaining IPO underpricing is related to the asymmetric information problem. Based on different participants in IPOs, the asymmetric information problem can be referred to different forms such as the 'winner's curse' problem, *ex ante* uncertainty, and the signaling effect.

The 'winner's curse' model (Rock, 1996) assumes two types of investors in the market: informed and uninformed investors. Informed investors purchase good quality shares, whereas uninformed investors cannot distinguish between good and bad quality shares. The existence of asymmetric information decreases the likelihood for uniformed investors to obtain a reliable prediction on the true value of the firm. Therefore, the 'winner's curse' problem occurs. Potential losses will result uninformed investors to leave the IPO market if they are not properly compensated. To ensure the participation of uninformed investors, it is rational for the issuer to provide an offering price with a discount, hence underpricing (Ritter, 1984; Rock, 1986). The *ex ante* uncertainty hypothesis addresses the asymmetric information problem between the issuer and investors who face uncertainties when investing in the firm. Beatty and Ritter (1986) propose a positive relationship between IPO underpricing and *ex ante* uncertainty about the issuer's value. *Ex ante* uncertainty can be measured by the firm's characteristics, such as firm age, firm size, the industry in which the firm is operating, and the size of IPO. Beatty and Ritter (1986) propose the role of underwriters in reducing such *ex ante* uncertainty. Highly reputable underwriters can

help signal the quality of IPOs and thus reduce asymmetric information between the issuer and potential investors. In addition, IPO underpricing can be strategically used by the issuer signaling the quality of the firm to potential investors (Allen and Faulhaber, 1989). Because investors believe that only good quality firms can afford the cost of signaling by using IPO underpricing.

6.3.2 Studies of Chinese IPO underpricing

Previous studies report that Chinese IPO underpricing ranges from 75% (Gannon and Zhou, 2008) to 289% (Mok and Hui, 1998), which is the highest in the world. Different explanations are found based often on using the asymmetric information theory to explain high IPO underpricing in China.

Mok and Hui (1998) examine a sample of 87 A-share IPOs issued on the Shanghai Stock Exchange between 1990 and 1993. They document that IPO underpricing for their sample IPOs is 289% after excluding the market effect (the initial return is 362.3%). The authors attribute high IPO underpricing to the long waiting between the offering day and the first trading day. A longer waiting period increases uncertainty, hence a higher underpricing is needed to compensate investors. Su and Fleisher (1999) examine 308 Chinese IPO firms between the period 1987-1995 and report a 231% underpricing on average. They indicate that a firm uses underpricing as a strategy to signal its value to outside investors and leads to the high underpricing ratio. The authors also find that firms can recoup the cost of underpricing by issuing Seasoned Equity Offerings (SEOs) in the following years. Yu and Tse (2006) report that the average initial return of 343 A-share IPOs is 123.59% from

1995 to 1998. They find uninformed investors have much higher probability of receiving overpriced IPOs than informed investors, which is consistent with the winner's curse theory. The authors indicate that the winner's curse problem in China is caused by the lower transparency, the large number of individual investors (which take up over 90% of total investors) without having access to sufficient information about IPO firms and the control of IPO supply from the government. Chang et al (2008) find the average initial returns of 891 IPOs from 1996 to 2004 is as high as 123% and the authors attribute the higher abnormal returns on the first IPO day to the asymmetric information hypothesis. The asymmetric information hypothesis suggests that when investors know less about the IPO shares than the existing traded shares, they are bearing the higher risks of buying IPOs. Moreover, the authors provide some new insights regarding the role of the lottery ratio on IPO return. Due to the pricing intervention from the government, the P/E ratios are much lower in the primary market than in the secondary market. The pricing gap provides the room for speculation thus leads to higher IPO demand in the primary market. Hence, the lottery ratio represents the demand of primary market and has no impact on the secondary market IPO returns.

Apart from explanations based on the asymmetric information theory, more recent studies have begun to analyze China's high IPO underpricing based on specifically Chinese characteristics, such as government control and regulations in the IPO market. For example, Chi and Padgett (2005) find the underpricing is 129.16% for 668 IPO firms between 1996 and 2000. They conclude that the underpricing mainly resulted from the large number of uninformed investors and the shortage of IPO supply under the quota

system. The authors also indicate that government ownership (normally covering around 70% of our sample IPOs) fails to send out signals regarding the quality of the IPO firms. Instead, they argue that the government is better at capturing the market opportunities during the hot IPO issue periods and hence receive better market returns. Tian and Megginson (2007) document an average underpricing of 247% based on a sample of 1397 IPOs between 1991 and 2004. They argue that the high IPO underpricing resulted from Chinese regulations, including the quota system, the intervention in IPO pricing, and the waiting-time regulation.

In sum, the above mentioned studies provide consistent conclusions on the high ratio of Chinese IPO underpricing using different explanation theories. However, these results are mainly based on main stock boards and most of the studies were carried out before the setting up of two new stock boards. Therefore, it is necessary to update the existing literature by adding in IPO performance evidence from new boards, which is one of our contributions to the literature.

6.3.3 Empirical studies on how PE investment affects IPO performance

The role of VC/PE in affecting IPO pricing is normally explained by the monitoring (governance) hypothesis and the certification hypothesis. Based on a sample of 433 VC-backed IPOs from 1978 to 1987, Barry et al (1990) document that monitoring services provided by VC investors play a positive role in reducing IPO underpricing. Since many of these VC capitalists are repeated participants in the capital markets, the experience of VC investors can be regarded as sending out positive signals to outside investors during

the IPO process. As a result, IPOs with high quality VC capitalists are less underpriced. Megginson and Weiss (1991) also highlight the certification role of VC investors in reducing IPO underpricing. They compare VC-backed IPOs to non-VC-backed IPOs between 1983-1987 in the US market and document that VC-backed IPOs are less underpriced than non-VC-backed IPOs. The authors argue that venture capitalists are more capable of assessing the intrinsic value of the firm. Therefore the involvement of VC in the IPO can be regarded as a positive signaling/certification about the firm's prospective development. However, Lee and Wahal (2004) argue that VC investment is not a random selection; it may be a result of an endogenous choice by both entrepreneurs and venture capitalists. To solve the endogeneity problem, Lee and Wahal (2004) estimate a Heckman two-stage selection model and document that VC-backed firms do not have lower underpricing than non-VC-backed firms.

Another feature regarding the entry of PE investors is that they can improve corporate governance by making use of their managerial skills and value increasing activities. This effect should be reflected in the long-run performance of the portfolio firms. Brav and Gompers (1997) examine 934 US VC-backed IPOs compared to a matched sample of non-VC-backed IPOs during 1972-1992. They report that VC-backed firms outperform non-VC-backed firms on average. They attribute the better long-run abnormal performance of VC-backed firms to the improved corporate governance structures after the entry of VC investors. Krishnan et al (2011) examine 1503 US VC-backed IPOs during the period of 1993 and 2004. They describe IPOs backed by more reputable VC investors performing better in the 3-years post-IPO period. The authors argue that

reputable VCs are able to select better reputation portfolio firms, hold a higher proportion of shares and take more board seats in portfolio firms, hence the firm's corporate governance is improved after the entering of VC investors. Similar studies have also been carried out in emerging economics. For example, Minardi et al (2013) examine the performance of PE-backed IPOs in Brazil during 2004-2008. The average one-year accumulated abnormal returns (CAR) for PE-backed IPOs is 13.72%, whereas it is -3.23% for non-PE backed IPOs. The authors explain this result by noting that PE investors are good at selecting firms with better quality of corporate governance. However, the authors acknowledge that stock market returns for PE-backed IPOs may not be provided by value-added activities from PE investors; instead the higher stock market returns may be caused by PE investors' market timing behaviour.

As far as the Chinese PE market is concerned, Jiang et al (2014) compare 153 VC-backed IPOs to 326 non-VC backed IPOs listed on the SME board and the ChiNext board from June 2004 to March 2010. They find that VC-backed IPOs have lower initial underpricing, which can be explained by the value-added activities provided by VC investors. These findings are in line with the certification and monitoring hypothesis. However, Jiang et al (2014) did not address the long run performance of VC-backed IPOs. Tan et al (2013) argue that due to the adverse selection problem, firms that are listed on the SME board are more risky on average and Chinese VC investors are rent-seeking orientated. Therefore, these domestic VC investors neither add value to their invested firms in the IPO process nor improve the firm's operating performance. Although both Tan et al (2013) and Jiang et al (2014) focus on the underpricing performance of VC-backed IPOs in China,

they have provided inconsistent results. The existing studies of Chinese PE-backed IPO provide some possible insights regarding the role of PE investors. However, it is still not clear what kind of mechanism affects underpricing. We want to provide the most likely explanation for underpricing of PE-backed IPOs in the rest of this chapter and this is another contribution to the literature.

6.4 IPO underpricing

6.4.1 Data and methodology

We refer to 1301 IPO firms (including 295 PE-backed IPOs) listed on the Chinese stock markets between 2001 and 2011. The reason our sample period starts from 2001 is that there were few PE-backed IPOs in the 1990s and most of them emerged after 2001. Because the regulation and market conditions changed greatly after 2000, we use IPO firm information after that date to avoid potential outlier issues. Our data come from two sources. We use information from *China Stock Market & Accounting Research database* (*CSMAR)* for IPO information and firm accounting information (including income statement and balance sheet). PE investment related information (whether a PE investment took place, PE deal information and PE investor information) is collected from *Asian Venture Capital Journal Dataset* (*AVCJ)*.

For measuring IPO underpricing, we use the following formula to calculate the return from IPO firm *i* on day *t* : $IR_{i1} = \frac{P_{i1} - P_{i0}}{P_{i0}}$, where IR_{i1} is the total return from stock *i* on its first trading day, P_{i1} is the closing price of stock *i* on the first trading day and P_{i0} is the offering price of stock *i*.

We also construct two market-adjusted abnormal returns $(MAARs)$ by taking market effect into account. For the first index $MAAR\_SH$, the Shanghai Stock Exchange Composite A-share Index is used as the benchmark for the whole sample. We use a second index $MAAR\_SZ$ to separate the market effect from different stock boards, the Shanghai Stock Exchange Composite Index is used as a benchmark for Shanghai stock board listed IPOs

while Shenzhen Component Index is used for Shenzhen stock market listed IPOs separately. The Shenzhen Component Index not only captures Shenzhen main board IPOs, but also includes SME board IPOs and ChiNext IPOs[37]. Using different stock index benchmarks, the market-adjusted abnormal return $\left(MAAR_{ir}\right)$[38] for stock i on the first trading day is defined as follows: $MAAR_{i1} = IR_{i1} - R_{m1}$, where R_{m1} is the return of market benchmark during the same period, defined as $r_{m1} = \frac{p_{m1} - p_{m0}}{p_{m0}}$, where p_{m1} is the closing price for the corresponding benchmark index on the first trading day and p_{m0} is the closing price of the market index on the offering day.

6.4.2 Empirical models and variables

To examine the effects of PE investment on IPO underpricing, we use a regression model on IPO performance factors plus a dummy variable which is defined as PE=1 for PE-backed IPO and PE=0 otherwise. The endogeneity problem arises when there are other factors affecting the decision to receive PE investment. Therefore, we address the potential selection bias problem by using a two-stage Heckman model following Lee and Wahal (2004) and Jiang et al (2014). In the first stage of Heckman model we control the factors for PE investment.

The first stage of Heckman model is as follows:

[37] We do not separate new board IPO from main board IPO using different market index. Because the SME Component Index was launched in June 2004 and ChiNext Price Index was released in June 2010 and so cannot represent or cover the majority of our new board IPOs.

[38] When $MAAR_{ir}$ is interpreted as an abnormal return, it is assumed that the systematic risk of the IPOs under consideration is the same as that of the index, i.e., the betas of the IPOs average to unity. However, previous studies have indicated that that the average beta of newly listed firms is higher than one. As a result, the calculated abnormal return $MAAR_{ir}$ provides an upward-biased estimate of the IPO performance relative to the market (Chi and Padgett, 2002).

$$\text{Probit}(PE) = \beta_0 + \beta_1 Size_i + \beta_2 Age_i + \beta_3 Leverage_i + \beta_4 ROA_i + \beta_6 Industry + \varepsilon_i \quad (6.1)$$

Where the independent variable is a dummy variable taking 1 if the IPO is backed with PE investment and zero otherwise. The independent variables include: (a) Firm size $(Size)$, which is defined as the natural logarithm of total assets in the last fiscal year before IPO; (2) firm age (Age) measures the time of PE investment, which is calculated using the IPO year minus the firm's establishment year; (3) The debt to equity ratio $(Leverage)$ is selected to represent the total debt to total equity in the last fiscal year before IPO; (4) The return on assets ratio (ROA) is calculated as the net income divided by total assets in the fiscal year prior to IPO. (5) Industry classifications are controlled in the equation by adding industry dummies $(Industry)$. (6) Year dummy $(Year)$ is also controlled. All of the independent variables are commonly found in previous literature as determinants of PE decisions (Gompers, 1996; Lee and Wahal, 2004; Jiang et al., 2014).

In the second stage, we run the regression following the following equation:

$$Underpricing_i = \beta_0 + \beta_1 PE + \beta_2 Size_i + \beta_3 Age_i + \beta_4 Underwriter_i + \beta_5 Proceeds_i + \beta_6 PEratio_i + \\ + \beta_7 Lottery_i + \beta_8 Delay_i + \beta_9 Volatility + \beta_{10} State_i + \beta_{11} Lambda_i + \beta_{12} Industry + \beta_{13} Year + \varepsilon_i \quad (6.2)$$

Where the dependent variables include three underpricing indicators: $MAAR\_SH$ and $MAAR\_SZ$ and IR_{i1}. The key testing variable is the PE dummy variable which represents 1 if the IPO firm has received PE investment before and 0 otherwise. A group of variables are used to control for underpricing determinants: (1) Firm size $(Size)$, which is defined as the natural logarithm of total assets in the last fiscal year before IPO. According to Beatty and Ritter (1986), smaller size firms publish less information than large firms and are

normally regarded as more risky and with higher uncertainty. (2) Firm age (Age) at the time of PE investment, which is calculated using the IPO year minus the firm's year of establishment. Ritter (1991) used age as a measurement for ex-ante uncertainty and found older firms have lower risk and to be likely to experience less underpricing than those young firms. (3) Underwriters' reputation $(Underwriter)$. Carter et al (1998) suggest that IPOs with prestigious underwriters, cause the least ex-ate uncertainty for shareholders and show a low level of underpricing. This variable equals one if the underwriter is from a high reputation group shown in Appendix 6.2. Appendix 6.2 provides a list of high reputation underwriters and the construction of underwriter ranking. (4) IPO proceeds $(Proceeds)$ is measured by the natural logarithm of IPO proceeds. Chemmanur's (1993) model shows that lower underpricing is associated with larger gross proceeds from the IPO. (5) Offering price to earnings ratio $(PEratio)$. According to the asymmetric information theory, the higher the offering P/E ratio, the less space for high initial returns and vice versa (Ljunqvist, 2004). (6) The odds of winning the lottery $(Lottery)$. As indicated by Chi and Padgett (2005), when fewer people want to invest in a certain IPO, a higher lottery ratio leads to lower demand and causes less underpricing. (7) Lag days $(Ldays)$, these are measured by the listing day minus the day of PE investment. Chan et al (2004) indicate that long lag days increase risk for investors and require higher underpricing. Mok and Hui (1998) support that the lag days as a key determinants of market-adjusted IPO underpricing for Chinese IPOs. (8) Volatility $(Volatility)$ is the standard deviation of market return in the past 90 days of IPO. Firm's underpricing is positively related to market volatility (Lowry et al., 2010). (9) State ownership $(State)$, measured by the percentage of shares held by the State. The government knows more than investors about the quality of

the IPO firm and the level of risk involved in the initial issue. To convince and attract outside investors, the government tends to set up lower IPO offering prices and this leads to higher underpricing (Chi and Padgett., 2005). (10) The inverse mills ratio (Lambda) from the first stage is controlled for potential selection bias for IPOs backed with PE investment in the second stage. (11) Industry dummy $(Industry)$ and year dummy $(Year)$ are controlling in all equations. All the definitions of the variables are summarized in Appendix 6.3.

6.4.3 Sample distribution

Table 6.2 presents the Pearson correlation coefficients among variables that are relevant in this study for the match-pair sample. The correlation coefficients are reported for both PE-backed group and non-PE-backed group. We find that there is a positive and significant correlation between PE investment dummy and firm age (Age). But there is no significant relationship between PE investment dummy and other firm characteristic variables, including firm size $(Size)$, leverage ratio $(leverage)$ and ROA (ROA). We find underwriter's reputation $(Underwriter)$, IPO proceeds $(Proceeds)$, lottery ratio $(Lottery)$, PE lag day $(Ldays)$ and State ownership are negatively related to PE financing. We also notice a non-significant correlation between PE financing and IPO PE ratio $(PEratio)$ and stock market volatility $(Volatility)$. The likelihood of PE financing is also found leading to a decrease in both initial stock market returns (IR) and adjusted stock market returns $(MAAR\_SH)$. These results provide a preliminary impression that PE investment has a potential for lower underpricing.

Table 6.2 Pearson Correlation coefficients

This table presents the correlation coefficients of 1301 IPO firms (including 295 PE-backed IPOs) listed on the Chinese stock markets between 2001 and 2011. PE dummy (*PE*), equals 1 if the IPO is backed with PE investment and 0 otherwise; firm size (*Size*), is the natural logarithm of firm size at the time of IPO; firm age (*Age*), measured by the PE investment year minus the year of establishment; leverage ratio (*Leverage*) is the debt/equity ratio at the last fiscal year before IPO; *ROA* is calculated as the net income divided by total assets at the fiscal year prior IPO; underwriter dummy (*Underwriter*) equals 1 if the underwriter is from top list and 0 otherwise; offer price to earnings ratio (*PEratio*); lottery ratio (*Lottery*) is the percentage of winning the IPO lottery; Lday (*Delay*) is the number of days between the offering day and the IPO day; volatility (*Volatility*) measures the 90-day market return volatility before the IPO day; the natural logarithm of IPO proceeds (*Proceeds*) controls for the size of the offering; the State ownership is the size of shares controlled by the State.

No	Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	*PE*	1													
2	*Size*	0.0250	1												
3	*Age*	0.0904*	0.0226	1											
4	*Leverage*	-.0185	0.3948*	0.0172	1										
5	*ROA*	-0.0047	-0.1003*	-0.0373	-0.0690*	1									
6	*Underwriter*	0.0959*	0.0657*	0.0248	0.0067	-0.0714*	1								
7	*Proceeds*	0.1433*	0.0577*	-0.0161	0.0226	-0.0328	0.2149*	1							
8	*PEratio*	0.0226	-0.0758*	0.0007	0.0129	-0.0365	-0.0419	-0.0092	1						
9	*Lottery*	0.1003*	0.0002	0.0763*	0.0053	-0.0235	0.0428	0.1893*	0.0083	1					
10	*Delay*	-0.1248*	0.0383	-0.1967*	0.0232	-0.0112	-0.0548*	-0.0822*	0.0191	-0.0910*	1				
11	*Volatility*	-0.0067	-0.0094	-0.0042	0.0306	-0.0038	0.0381	0.0850*	-0.0157	-0.0294	0.0179	1			
12	*State*	-0.1818*	0.0662*	-0.2392*	0.0460*	-0.0959*	0.0068	0.1623*	-0.0162	-0.0890*	0.2442*	0.0729	1		
13	*IR*	-0.1183*	0.0236	-0.2055*	-0.0035	0.0324	-0.0011	-0.0391	-0.0128	-0.2071*	0.2049*	0.3291*	0.1993*	1	
14	*MAAR_SH*	-0.1202*	0.0241	-0.2084*	-0.0067	0.0311	-0.0033	-0.0489	-0.0114	-0.2116*	0.1987*	0.2769*	0.2080*	0.9919*	1

Table 6.3 reports the firm characteristics and IPO performance of PE-backed and non-PE backed IPO firms. More specifically, we examine firm size, firm age, profitability, debt situation, ownership structure, IPO size and IPO issuing information. The firm age variable shows that IPO companies normally go public 6 to 7 years after their establishment. However, firms backed by PE investment are listed 7.15 years after its setting up, which is one year older than the other group on average. It is found that PE-backed firms hold larger total assets and use lower level of leverage ratio but the observed differences between the two groups are not significant. The ROA value suggests that both IPO groups are similar in profitability. It is also observed that PE-backed firms have a significantly lower State-ownership ratio than the other group. Regarding IPO information, we find PE-backed IPOs are backed by more reputable underwriters, higher online lottery ratio and shorter lag days between offering day and IPO day. There is no significant difference in price to earnings ratio and stock market volatility between these two groups. The PE-backed firms have significantly larger IPO proceeds value than their non-PE backed peers. Our main testing variables are the initial underpricing, $MAAR\_SH$ and $MAAR\_SZ$. The initial underpricing $\left(IR_{i1}\right)$ for PE-backed IPOs is 0.57 while for non-PE backed IPOs it is 0.80. We observe similar results in the market-adjusted abnormal returns $\left(MAAR_{i1}\right)$ for $MAAR\_SH$ and $MAAR\_SZ$, the value is 0.80 for non-PE backed IPOs and 0.57 for PE backed IPOs. Overall, the descriptive analysis documents some significant differences in both firm and IPO characteristics between PE-backed IPOs and non-PE backed IPOs. We find initial evidence PE-backed IPOs have significantly lower underpricing than that of non-PE backed IPOs.

Table 6.3 Descriptive statistics

	Whole sample		Non-PE Backed IPOs		PE-backed IPOs		T test Mean
	Mean (1)	Median (2)	Mean (3)	Median (4)	Mean (5)	Median (6)	(3)-(5)
Size	20.24	20	20.23	20	20.30	20.01	-0.90
Age	6.41	5.61	6.19	5.06	7.15	6.95	-3.27***
Leverage	0.73	0.46	0.74	0.48	0.69	0.43	0.68
ROA	0.05	0.04	0.05	0.04	0.05	0.04	0.26
Underwriter	0.60	1	0.57	1	0.68	1	-3.47***
Proceeds	22.02	21.88	21.94	21.79	22.26	22.11	-5.22***
PEratio	65.68	43.83	64.17	43.43	70.82	45.19	-0.81
Lottery	0.86	0.43	0.72	0.36	1.31	0.65	-3.63***
Delay	13.81	13	14.27	14	12.24	11	4.53***
Volatility	0.02	0	0.02	0	0.02	0.01	0.25
State	0.17	0	0.20	0	0.09	0	6.66***
IR	0.75	0.50	0.80	0.56	0.57	0.35	4.29***
MAAR_SH	0.75	0.51	0.80	0.56	0.57	0.37	4.36***
MAAR_SZ	0.75	0.51	0.80	0.56	0.57	0.39	4.28***
Obs.	1301	1301	1005	1005	296	296	

6.4.4 How PE investment affects IPOs underpricing

The Heckman model outcome is shown in Table 6.4. Panel 1 reports the determinants of PE investment from the Heckman first stage Probit model. The table shows firms with longer operating history and larger size are more likely to accept PE investment in general (t value equals 3.31 and 1.69 respectively). However, the leverage $(Leverage)$ and the firm performance measurement (ROA) are not significant, which fails to explain whether the IPO is backed by PE investment. The lambda ratio is generated after the Probit model and added to the second stage.

Panel 2 of Table 6.4 reports the impact of PE investment on IPO underpricing. We have constructed two models by using different independent variables: $MAAR\_SH$ and IR_{i1}[39]. In both models, PE-backed IPOs show lower underpricing compared to non-PE backed IPOs. For the control variables, older firms (Age) tend to have lower underpricing because mature firms are less risky for investors and hence require less underpricing (Ritter, 1991). A higher lottery ratio $(Lottery)$ leads to lower demand for IPOs and thus results in lower underpricing. A positively significant relationship is found between lag days $(Lday)$ and underpricing, indicating that long lag days cause higher risk so higher underpricing is a good way to compensate the investors. The stock market volatility $(Volatility)$ before IPO does have a positively significant impact on the first-day returns. Larger IPO proceeds help to decrease underpricing. Higher level of State ownership $(State)$ is also regarded as sending out a signal to the market regarding the quality of the firm and inducing a positive impact on first day IPO returns. The Lambda ratio $(Lambda)$ is negatively significant in the

[39] We observe very similar results between $MAAR\_SZ$ and $MAAR\_SH$. To avoid duplicated results, we only report regression results using $MAAR\_SH$ and IR_{i1} as dependent variable.

market adjusted model but not in the initial returns model, suggesting the unobserved factors result in lower underpricing. The negative Lambda ratio further confirms the necessity of using the Heckman two-stage selection model.

These findings provide some consistent results to add to the mature stock market findings. Some of the potential reasons for lower underpricing can be summarized as the following: the 'certification' role of PE investment proposed by Megginson and Weiss (1991); the involvement of PE investors helps to ensure the future corporate governance improvement of the firm (Barry et al., 1990); by providing the new financing channel (Brown and Floros, 2012); for high reputation PE investors, they tend to send out positive signals regarding the future value of the firm to outside investors (Beatty and Ritter., 1986); PE investors would like to set up higher offering pricing to increase their returns which can be regarded as the speculative behaviour of PE investors. All of the above mentioned potential channels help to describe lower underpricing for PE-backed IPOs but we cannot conclude directly which statement is supportive to our empirical results. To solve this problem, we narrow down our sample to PE-backed IPOs only in the next section. To help us understand the underpricing mechanism, we add some PE related testing variables to the following PE-backed IPO models.

Table 6.4 Heckman model results

This table adopts the Heckman selection model to control endogeneity. In the first stage regression, the dependent variable is the IPO decision. The independent variables include: firm size ($Size$), natural logarithm of firm size at the time of IPO; firm age (Age), measured by the PE investment year minus the year of establishment; leverage ratio ($Leverage$) which is the debt/equity ratio at the last fiscal year before IPO; ROA is calculated as the net income divided by total assets in the fiscal year prior to IPO. In the second stage, the dependent variable is the $MAAR\_SH$ and IR . The testing variable is PE dummy, equaling 1 if the IPO is backed with PE investment and 0 otherwise. The independent variables include: firm age; underwriter dummy ($Underwriter$) equaling 1 if the underwriter is from top list and 0 otherwise; offer price to earnings ratio ($PEratio$); lottery ratio ($Lottery$) which is the percentage of winning the IPO lottery; Lday ($Delay$) is the number of days between the offering day and the IPO day; volatility ($Volatility$) measures the 90-day market return volatility before the IPO day; the natural logarithm of IPO proceeds ($Proceeds$) controls for the size of the offering; the State ownership is the size of shares controlled by the State. The figures in parentheses are the t-statistics.

Panel 1. 1st stage: the determinants of PE investment

Cons	-2.6659
	(-3.38)***
Size	0.0628
	(1.69)*
Age	0.0280
	(3.31)***
Leverage	-0.0703
	(-1.27)
ROA	0.0380
	(0.05)
Industry	Included
$Wald\ Chi^2$	22.18
$(p-value)$	(0.0046)
Obs	1301

Panel 2: 2nd stage: the impact of PE investment on IPO underpricing

	(1) *MAAR_SH*	(2) *IR*
Cons	215.9419	197.094
	(2.42)	(2.08)
PE	-8.5091	-9.0660
	(-1.83)**	(-1.93)**
Size	0.3338	0.4254
	(0.17)	(0.20)
Age	-3.4503	-3.4764
	(-4.79)***	(-4.61)***
Underwriter	2.6795	2.5413
	(0.64)	(0.61)
Proceeds	-2.3248	-1.8054
	(-1.02)	(-0.78)
PEratio	-0.0017	-0.0023
	(-0.18)	(-0.24)
Lottery	-5.1491	-5.1143
	(-2.23)***	(-2.24)***
Delay	1.0437	1.2106
	(3.54)***	(3.99)***
Volatility	1.0961	1.3242
	(8.27)***	(9.73)***
State	0.2494	0.2122
	(2.58)***	(2.20)***
Lambda	-50.6404	-49.7504
	(-1.97)***	(-1.76)**
Industry	Included	Included
Year	Included	Included
Adj R_sq	0.1970	0.2235
F − statistic (p−value)	18.40	19.93
	(0.0000)	(0.0000)
Obs	1301	1301

6.4.5 Regression results on underpricing of PE-backed IPOs

In the previous section, we have raised the question of why Chinese PE-backed IPOs experience lower underpricing which may be due to PE investors' reputation factors, the speculation of PE investors or the corporate governance role of PE investors. To solve this question, we reduce our sample to PE-backed IPOs only. By adding PE related variables, the purpose is to examine how PE factors affect IPO underpricing directly.

Four PE related factors are used in our model: PE amount, PE deal stake, PE investor's reputation and PE investment Pre-IPO type. PE amount (*PEamount*) is measured using the cumulated total amount of PE investment received before IPO to divide the firm's total assets. PE deal stake (*PEdeal*) is the accumulated total shares controlled by PE investors before IPO. These two variables capture the most direct effect of PE investment in IPO firms. The PE reputation (*PEreputation*) indicator helps to control investor's behaviour. For measuring PE reputation, we collect the annual *China Venture Capital and Private Equity Annual Ranking* report provided by Zero2IPO group[40]. In this annual report, the ranking of top 30 PE investors is announced based on overall survey information including investment, management, fundraising and exit. The ranking was initiated by Zero2IPO dataset in 2001 and has become well-known for providing sound evaluation and a reference system to both investors and portfolio firms. We collect the top 30 PE firms listed on China Venture Capital and Private Equity Annual Ranking from 2007-2011 for two reasons: firstly, this period covers the booming PE-backed IPO market in China; secondly, the report before 2006 did not differentiate venture capitalists and PE investors. The name and country of these top 30 PE investors are reported in Appendix 6.4. Another testing variable in our model is the new board dummy (*Newboard*), which equals to 1 if

[40] Founded in 1999, Zero2IPO is a leading integrated service provider in the China venture capital and private equity industry.

the IPO is listed on new boards and equals to 0 if listed on main boards. This testing variable helps to control investor behaviour on different stock boards. Guo and Fung (2011) find that new boards, especially the ChiNext board was under high speculation. As a result, the Shenzhen Stock Exchange authority issued regulations intended to monitor and control risk and so minimize the excessive speculative trading risk of new board IPOs in September 2014. All the definitions of the variables are summarized in Appendix 6.2.

Our empirical model is as follows:

$$Underpricing_i = \beta_0 + \beta_1 PEamount_i + \beta_2 PEdeal_i + \beta_3 PEreputation + \beta_4 Newboard + \beta_5 Size_i + \beta_6 Age_i + \\ + \beta_7 Underwriter + \beta_8 \text{Pr}oceeds_i + \beta_9 PEratio_i + \beta_{10} Lottery_i + \beta_{11} Delay_i + \beta_{12} Volatility + \beta_{13} State_i + \\ + \beta_{14} Lambda_i + \beta_{15} Industry + \beta_{16} Year + \varepsilon_i$$

(6.3)

All the control variables are the same as those in equation 6.2.

Table 6.5 reports the empirical results. We first run each testing variables respectively in the first four models, then combine all the testing variables into model five to see the joint effects. $MAAR\_SH$ and IR are reported as dependent variable respectively in panel 1 and 2. In panel 1, the PE amount variable ($PEamount$) is negatively significant in both model 1 and model 5, suggesting that a large PE investment leads to lower underpricing. This could be explained by: 1) PE investors have better understanding and techniques for valuing the ready-listed firm. Hence, they help with setting the offering price closer to the IPO firm's intrinsic value. The higher offering prices reduce the abnormal returns from the secondary market and result in lower underpricing; 2) PE investors are more speculative in setting up high offering prices so they can exit with higher returns. We find PE deal stake ($PEdeal$) has no impact on IPO performance which is consistent with the fact that most PE investors become minority shareholders in their Chinese portfolio

companies. This result also suggests that there is no governance role of PE investment that reduces IPO underpricing. The PE reputation (*PEreputation*) variable is also insignificant in both model (3) and model (5), which does not support the certification/monitoring hypothesis proposed by Megginson and Weiss (1991) and Barry et al. (1990). We also find firms listed on new boards experience lower underpricing than main board listed firms. This observation is consistent with the fact that the establishment of new boards has provided easier listing channels and encouraged qualified firms to go listed. Since IPO is the easiest and more profitable way for PE exit, PE investors captured the opportunity and rushed into the IPO pool. As a result, speculation happened and the PE-backed IPOs, especially on new boards, experience lower underpricing than the non-PE backed IPOs.

For other control variables, similar results on lottery ratio (*Lottery*), lag days before IPO (*Delay*), overall stock market volatility (*Volatility*) and state ownership (*State*) are found from the previous Table 6.4. We also observe the coefficient for P/E ratio (*PEratio*) is negatively significant, suggesting that firms with higher P/E ratios are more likely to experience lower underpricing which is consistent with the role of P/E ratio in convincing outside investors.

In panel 2 of Table 6.5, *IR* is used as independent variable. The observed results are consistent with that from panel 1 using *MAAR_SH* as dependent variable.

Table 6.5 The impact of PE investment on PE-backed IPOs, whole sample

This table shows the sample of PE-backed IPOs. The dependent variables are *MAAR_SH* and *IR* respectively. The testing variables include: *PEamount* measured using the cumulated total amount of PE investment received before IPO to divide firm's total assets; *PEdeal* is the cumulated total shares controlled by P investors before IPO; *PEreputation* captures whether the PE investor has a high reputation; *Newboard* variable equals 1 if the IPO is listed on new boards and equals to 0 if listed on main boards. The control variables include: natural logarithm of firm size(*Size*); firm age (*Age*); underwriter dummy (*Underwriter*) equals 1 if the underwriter is from top list and 0 otherwise; the natural logarithm of IPO proceeds (Proceeds) controls for the size of the offering; *PEratio* is the offer price to earnings ratio; *Lottery* is the percentage of winning the IPO lottery; *Delay* is the number of days between the offering day and the IPO day; *Volatility*measures the 90-day market return volatility before the IPO day;; the State ownership is the size of shares controlled by the State. The figures in parentheses are the t-statistics.

Panel 1. The dependent variable is IPO underpricing measured by *MAAR_SH*

	MAAR_SH				
	(1)	(2)	(3)	(4)	(5)
Cons	115.3612	186.3267	93.0927	15.7281	45.7844
	(0.91)	(1.26)	(0.73)	(0.12)	(0.32)
PEamount	-11.5267				-12.7568
	(-3.19)***				(-3.09)***
PEdeal		-16.5582			44.6419
		(-0.50)			(1.05)
PEreputation			8.4714		13.0372
			(1.06)		(1.64)
Newboard				-28.7603	-27.3254
				(-2.68)***	(-2.46)***
Size	0.7050	-0.8522	2.0519	1.9578	0.0883
	(0.28)	(-0.28)	(0.78)	(0.75)	(0.03)
Age	-1.1512	-1.1457	-0.9549	-0.9252	-0.9648
	(-1.32)	(-1.24)	(-1.06)	(-1.06)	(-0.98)
Underwriter	-8.2094	-6.1325	-6.8978	-7.1573	-8.1594
	(-1.13)	(-0.75)	(-0.87)	(-0.91)	(-1.10)
Proceeds	4.4522	-5.6159	-4.2895	0.0136	9.1370
	(0.69)	(-0.92)	(-0.85)	(0.00)	(1.24)
PEratio	-0.0145	-0.0139	-0.0160	-0.0145	-0.0184
	(-2.24)***	(-2.03)***	(-2.15)***	(-2.04)***	(-2.48)***
Lottery	-1.9023	-1.9668	-2.2524	-2.1902	-1.6840
	(-2.09)***	(-1.76)**	(-1.76)**	(-1.95)**	(-2.00)***
Delay	0.7884	1.4185	2.1405	1.9496	-1.6840
	(1.08)	(1.73)**	(2.77)***	(2.52)***	(-2.00)***
Volatility	0.0607	0.3540	0.8669	0.8043	0.0921
	(0.20)	(0.95)	(2.68)***	(2.50)***	(0.29)
State	0.7344	0.6953	0.6777	0.7493	0.9133
	(2.94)***	(2.63)***	(2.65)***	(2.87)***	(3.47)***
Industry	Included	Included	Included	Included	Included
Year	Included	Included	Included	Included	Included
Adj R_sq	0.1505	0.2232	0.1850	0.1865	0.1707
F−statistic (p−value)	3.46	2.44	4.01	4.42	2.94
	(0.0000)	(0.0033)	(0.0000)	(0.0000)	(0.0001)
Obs	248	243	289	294	232

Panel 2 The dependent variable is IPO underpricing measured by *IR*

	IR				
	(1)	(2)	(3)	(4)	(5)
Cons	111.1633	187.7817	76.5056	-8.1072	35.8811
	(0.87)	(1.25)	(0.59)	(-0.06)	(0.25)
PEamount	-11.8500				-13.0777
	(-3.27)***				(-3.14)***
PEdeal		-16.2638			45.5075
		(-0.49)			(1.09)
PEreputation			7.7745		12.5840
			(0.97)		(1.63)
Newboard				-31.9393	-29.3454
				(-2.87)***	(-2.60)***
Size	0.9122	-0.7283	2.3344	2.2302	0.3408
	(0.35)	(-0.23)	(0.85)	(0.82)	(0.12)
Age	-1.0660	-1.0734	-0.8793	-0.8459	-0.8630
	(-1.30)	(-1.24)	(-1.00)	(-0.99)	(-0.94)
Underwriter	-8.9971	-6.7188	-6.5718	-6.8159	-9.0885
	(-1.25)	(-0.82)	(-0.81)	(-0.85)	(-1.24)
Proceeds	4.3387	-6.1078	-4.1175	0.5783	9.2838
	(0.66)	(-0.99)	(-0.80)	(0.10)	(1.23)
PEratio	-0.0146	-0.0140	-0.0153	-0.0139	-0.0185
	(-2.26)***	(-2.03)***	(-2.07)***	(-1.97)**	(-2.51)***
Lottery	-1.8285	-1.8949	-2.2006	-2.1215	-1.6006
	(-2.10)***	(-1.76)**	(-1.77)**	(-1.98)***	(-2.04)***
Delay	1.1270	1.7785	2.5221	2.3283	1.2056
	(1.40)	(1.97)***	(3.01)***	(2.78)***	(1.37)
Volatility	0.2183	0.5358	1.1043	1.0410	0.2459
	(0.75)	(1.43)	(3.29)***	(3.12)***	(0.82)
State	0.7519	0.7100	0.6864	0.7707	0.9418
	(3.03)***	(2.70)***	(2.56)***	(2.83)***	(3.55)***
Industry	Included	Included	Included	Included	Included
Year	Included	Included	Included	Included	Included
Adj R _ sq	0.1765	0.1388	0.2211	0.2245	0.1993
F−statistic (p−value)	3.63	2.68	4.23	4.75	3.13
	(0.0000)	(0.0012)	(0.0000)	(0.0000)	(0.0001)
Obs	248	243	289	294	232

By extending the previous results, we further test PE impacts by subgrouping the sample firms according to PE type and investor's country of origin. The aim is to further explore PE investors' behaviour in the Chinese IPO market. PE type group is defined to 1 if PE is Pre-IPO type and 0 otherwise. Although Pre-IPO type focuses on helping the firm to go listing, in fact, all PE-backed firms are aiming for listing regardless of PE types during the hot stock market period. The investors' country of origin variable is based on whether the PE investment is made by a domestic or non-domestic PE investor. The results are shown in Table 6.6.

Table 6.6 The impact of PE investment on PE-backed IPOs

This table shows the subgroup testing of PE-backed IPOs. The first two groups are based on Pre-IPO group and non-Pre-IPO group. The last two groups are based on domestic PE investors and non-domestic PE investors. The dependent variable is $MAAR\_SH$. The testing variables include: PE amount ($PEamount$) is measured using the accumulated total amount of PE investment received before IPO to divide firm's total assets; PE deal stake ($PEdeal$) is the accumulated total shares controlled by P investors before IPO; PE reputation ($PEreputation$) captures whether the PE investor has a high reputation; New board dummy ($Newboard$) variable equals 1 if the IPO is listed on new boards and equals to 0 if listed on main boards. The control variables include: natural logarithm of firm size($Size$); firm age (Age); underwriter dummy ($Underwriter$) equals 1 if the underwriter is from top list and 0 otherwise; the natural logarithm of IPO proceeds ($Proceeds$) controls for the size of the offering; $PEratio$ is the offer price to earnings ratio; $Lottery$ is the percentage of winning the IPO lottery; $Delay$ is the number of days between the offering day and the IPO day; $Volatility$ measures the 90-day market return volatility before the IPO day;; the State ownership is the size of shares controlled by the State. The figures in parentheses are the t-statistics.

	(1) Pre-IPO group	(2) Non Pre-IPO group	(3) Domestic investors	(4) Non-domestic investors
Cons	-496.2592	22.2593	26.4530	819.3387
	(-2.19)	(1.12)	(0.17)	(1.42)
PEamount	-21.8544	-9.3743	-14.5527	-30.4803
	(-4.09)***	(-2.05)	(-3.22)	(-1.03)
PEdeal	130.7551	43.4577	78.9523	4.3740
	(1.76)	(1.03)	(1.42)	(0.05)
PEreputation	22.2890	2.8486	10.5555	28.9487
	(1.77)	(0.29)	(1.30)	(0.22)
Newboard	-37.8400	-17.6937	-33.5917	64.0564
	(-1.94)***	(-1.53)	(-2.99)	(0.97)
Size	-3.7510	-0.5200	1.9017	-13.2659
	(-0.66)	(-0.18)	(0.71)	(-0.43)
Age	-1.1652	-0.6970	-0.9898	-8.6437
	(-0.89)	(-0.50)	(-0.94)	(-0.64)
Underwriter	-4.2654	-9.6330	-8.4563	-46.1063
	(-0.28)	(-1.11)	(-1.09)	(-0.43)
Proceeds	42.8673	1.4036	9.5993	6.5223
	(4.31)***	(0.18)	(1.18)	(0.15)
PEratio	0.2900	-0.0222	-0.0165	-.3637
	(3.83)	(-2.52)	(-2.18)	(-0.36)
Lottery	-1.2904	-14.8319	-1.5218	-1.9514
	(-4.07)	(-2.66)	(-2.11)	(-0.11)
Delay	1.7149	0.4295	0.7455	-2.4340
	(2.31)	(0.45)	(0.91)	(-0.28)
Volatility	-0.0106	-0.1479	-0.2682	1.6823
	(-0.03)	(-0.31)	(-0.76)	(1.59)
State	-0.0598	0.9527	0.9332	0.3992
	(-0.14)	(3.24)	(3.70)	(0.22)
Industry	Included	Included	Included	Included
Year	Included	Included	Included	Included
Adj R _ sq	0.6257	0.2008	0.1806	0.7828
F−statistic (p−value)	10.26	2.31	2.99	5.68
	(0.00)	(0.00)	(0.00)	(0.05)
Obs	56	176	213	19

From the first testing group, we notice that PE amount helps to reduce underpricing for both Pre-IPO and non-Pre-IPO group, suggesting similar investment behaviour for all investors. All IPOs listed on new boards are found to experience lower underpricing than main boards IPOs. From the second testing group, PE investment from domestic investors leads to lower underpricing and the underpricing is particularly high for new board listed firms. We do not observe the same empirical results from the non-domestic PE investor group. Combining the behaviour and impact of different PE investors, we suggest that speculation exists regardless of PE types. The speculation behaviour is more commonly found in new board IPOs and in investment made by domestic PE investors.

To summarize, we find no evidence to support PE reputation or PE corporate governance effect. After excluding other possible explanations, we can attribute the lower underpricing to the speculation behaviour of PE investors in the Chinese market. We further approve this statement by carrying out sub-sample testing. We find PE investors, despite their investment amount and PE types, are willing to benefit from less underpricing. Due to the newly set-up of new boards, firms listed on new boards experience higher underpricing than firms on main boards. This finding is consistent with the fact that the setting up of new stock boards after 2005 and the Bull market in 2007, a large amount of PE capital rushed into the Chinese stock market to benefit from the high initial stock returns.

6.5 The impact of PE investment in the long term

In the previous section, we have confirmed that PE investment led to less underpricing in the Chinese stock market at the time of IPO. Considering the existence of speculation behaviour, it is useful to compare the impact of PE investment in China in the long-run to the existing mature market evidence.

Ritter (1991) has indicated that BHARs can be used to provide an unbiased measure for long-run abnormal returns on IPOs. In this section, we test the impact of PE investment in both 12 months and 24 months for the sample of 1301 IPO firms, including 296 PE-backed IPO firms. We do not include 3 years' aftermarket performance because some of the IPO firms were listed in 2011. When a firm in the portfolio is delisted or suspended from the stock markets, the portfolio return for the next month is an equally weighted average of the remaining firms in the portfolio[41].

To calculate long-term underperformance, the market adjusted buy-and-hold abnormal return is used. The aftermarket performance for IPO sample is computed as

$BHAR_{it} = \prod_{t=1}^{T}[1+R_{it}] \prod_{t=1}^{T}[1+R_{mt}]$, where R_{it} is the return of stock i in the $t-th$ trading month, and R_{mt} is the market index return for the corresponding period. Consistent with the previous IPO underpricing testing, we use Shanghai Stock Exchange Composite A-share index as benchmark for all of our sample IPOs.

To test the impact from PE investment to IPO performance in the long-run, we carry out the following two sets of regression model:

[41] There is one firm is our data that has been suspended from ChiNext stock market since June 2013 due to fake IPO application information provided.

$$BHAR_i^n = \beta_0 + \beta_1 PE + \beta_2 Size_i + \beta_3 Age_i + \beta_5 Sales_i + \beta_6 TobinQ_i + \beta_7 Leveragre_i + \\ + \beta_8 SEO + \beta_9 State_i + \beta_{10} Industry + \beta_{11} Year + \varepsilon_i \quad (6.4)$$

$$BHAR_i^n = \beta_0 + \beta_1 PEamount_i + \beta_2 PEdeal_i + \beta_3 PEreputation_i + \beta_4 Newboard_i + \\ + \beta_5 Size_i + \beta_6 Age_i + \beta_7 Sales_i + \beta_8 TobinQ_i + \beta_9 Leverage_i + \beta_{10} SEO + \beta_{11} State_i + \\ + \beta_{12} Industry + \beta_{13} Year + \varepsilon_i \quad (6.5)$$

In equitation 6.4, PE dummy is the testing variable. Apart from the control variables we used in the underpricing models, we remove some IPO performance related variables and add a few other controlling variables that may affect long-term performance. The first variable is Seasonal Equity Offering (SEO), which is a dummy variable equal to 1 if SEO is issued within two years after IPO and 0 otherwise. According to Welch (1989), the issuing prices of SEO after the IPO is three times higher than the initial IPO offering price, which is regarded as a strategy for high quality firms to compensate their cost of high underpricing at the time of IPO. Thus, the issuing of new equity usually leads to long-run underperformance as a result of the information asymmetry problem. The other variables to measure sales growth rate ($Sales$) at the time of IPO and Tobin's q ($TobinQ$). Chan et al. (2004) have proved that, although managers tended to manipulate operating performance before IPO, the change of operating performance is still important in adjusting stock prices in the long run. In equation (6.5), we narrow down the sample to PE-backed IPOs only. The testing variables include PE amount, PE deal, PE reputation and IPO listing board dummy. The same control variables are used in equation (6.3). For both equations, n equals to 12-month and 24-month periods respectively. The regression results are shown in Table 6.7.

Table 6.7 IPO underpermance regression: the effect of PE backing

This table shows the long term performance of PE-backed IPOs. The first two groups are based on whole sample IPOs in 12-months and 24-months period. The second groups are based on PE-backed IPOs in 12-month and 24-month periods. The dependent variable is the $MAAR\_SH$. The testing variables include: PE dummy, equals 1 if the IPO is backed by PE investment and 0 otherwise; PE amount ($PEamount$) is measured using the accumulated total amount of PE investment that have been received before IPO to divide firm's total assets; PE deal stake ($PEdeal$) is the accumulated total shares controlled by P investors before IPO; PE reputation ($PEreputation$) captures whether the PE investor is with high reputation or not; New board dummy ($Newboard$) variable equals 1 if the IPO is listed on new boards and equals 0 if listed on main boards. The control variables include: natural logarithm of firm size($Size$); firm age (Age); SEO dummy variable equals to 1 if SEO is issued within two years after IPO and 0 otherwise measures; sales growth ($sales$) is measured by the sales growth rate at the time of IPOs; Tobin's Q ($TobinQ$) is measured by the Tobin's Q at the time of IPOs; the State ownership is the size of shares controlled by the State. The figures in parentheses are the t-statistics.

	Whole sample IPOs		PE-backed IPOs	
	$BHAR^{12}$	$BHAR^{24}$	$BHAR^{12}$	$BHAR^{24}$
	(1)	(2)	(3)	(4)
Constant	-0.2573	-0.5311	0.4879	0.6989
	(-1.06)	(-2.32)	(1.02)	(1.37)
PE	0.0065	-0.0258		
	(0.25)	(-0.99)		
PEamount			-0.0564	-0.0506
			(-2.94)***	(-3.08)***
PEdeal			0.0713	0.0081
			(0.48)	(0.03)
PEreputation			-0.0430	-0.0646
			(-0.94)	(-1.45)
Newboard			0.1327	0.1797
			(1.73)**	(2.62)***
Size	0.0065	0.0079	0.0107	-0.0131
	(0.55)	(0.70)	(0.57)	(-0.74)
Age	-0.0023	-0.0018	-0.0068	-0.0071
	(-0.93)	(-0.66)	(-1.45)	(-1.79)
Sales	0.0085	0.0044	0.0961	0.1346
	(2.16)***	(0.76)	(5.29)***	(3.25)***
TobinQ	-0.0076	-0.0148	-0.0299	-0.0389
	(-0.51)	(-1.04)	(-1.24)	(-1.37)
Leverage	-0.0883	0.0197	0.0945	0.2365
	(-1.40)	(0.32)	(0.66)	(2.04)***
SEO	0.0263	0.0490	-0.0060	0.0482
	(0.54)	(1.20)	(-0.07)	(0.83)
State	0.0016	0.0025	0.0033	0.0030
	(2.89)***	(4.70)***	(2.57)***	(2.83)***
Industry	Included	Included	Included	Included
Year	Included	Included	Included	Included
Adj R_sq	0.0216	0.0305	0.1985	0.2926
F−statistic (p−value)	2.91	3.09	4.42	3.50
	(0.0004)	(0.0002)	(0.0000)	(0.0000)
Obs	1299	1299	232	232

In both 12-month and 24-month whole sample stock performance results, PE dummy variables are insignificant. For the controlling variables, high sales growth firms and firms with State ownership have better 12-month stock performance. In the 24-month period, only State ownership variable has positively significant impact on $BHAR$. These outcomes further confirm our previous results that PE investors are speculative in China stock market and do not provide any value added activities in the long run, such as corporate governance improvement. Nevertheless, the adjusted R squares in both 12-month and 24-month models are too small for the whole sample results.

We then reduce our sample to PE-backed IPOs only and the results are reported in Table 6.7 model (3) and (4). IPO firms with large PE amount (*PEamount*) and firms listed on new boards (*Newboard*) are found to experience a lower return in the long-run. The standardized coefficient for PE amount is -22.21% in a 12-month period, which is slightly lower than the 19.29% in a 24-month period. In both models, PE reputation factors and PE deal stake are found to be insignificant.

These results help to provide more insights into our previous questions. Firstly, we can conclude that the underpricing of PE-backed IPOs may not be caused by certification hypothesis or the corporate governance effect from PE investors. The testing variables for these two theories, PE reputation (*PEreputation*) and PE deal stake (*PEdeal*), are shown as insignificant in all of our model results. Secondly, our results support the financing role of PE investment in the Chinese IPOs, shown by the PE amount variable (*PEamount*). The above results support our previous suggestion concerning the speculation behaviour of PE investors in the Chinese stock market. In contrast to findings on lower long-term performance of new board IPOs (Anderson et al., 2013), we observe PE-backed firms listed on new boards experience better long term performance. This may be explained by

the fact that our sample PE-backed IPOs are still under a fast expanding Chinese PE market and investors in the secondary market have higher expectations on the new board listed firms.

6.6 Conclusion

Using a sample of 1301 Chinese IPOs, including 295 PE-backed IPOs issued from 2001 to 2011, we study the role of PE investment in Chinese mainland IPOs. We demonstrate a number of results that fill the gap between existing literature review based on mature market economics and the evidence of PE investment in the Chinese stock market. Our main findings are as follows.

Firstly, we find that PE-backed IPOs experience lower underpricing than non PE-backed IPOs. This finding implies that PE investment does enhance firm performance and provides some consistent results to general literature based on mature market evidence, such as PE certification role. However, thinking about the hot IPO market in China, it can be argued that there may be other possible explanations for low underpricing, such as PE investor's speculation behaviour, PE investor's reputation and corporate governance effect from PE investors. To prove that, we narrow down our sample firms to PE-backed IPOs only. We find the amount of PE investment has a negatively significant relationship with the underpricing that is, PE investors with a large amount of PE investment are more willing to set up high offering price and benefit from the initial IPO returns. In contrast to the normal 'leave the money on the table' strategy of PE investors, this result unveils the speculation tendency of Chinese PE investors. We also observe that firms listed on new boards experience higher speculation than their main board peers. Both PE reputation and PE deal stake variables are not statistically significant which denies our explanation of the effect of PE reputation and PE corporate governance role. Moreover, by dividing PE-backed IPOs into different sub-groups, the following outcomes are found: regardless of PE types, all PE-backed IPOs experience lower underpricing; Chinese domestic PE investors lead to lower underpricing than non-domestic PE investors. The above sub-sample tests provide additional outcomes in proving the speculation behaviour of PE

investors in the Chinese stock markets.

Secondly, we expand our IPO samples by including their aftermarket performance in both 12-month and 24-month periods. Comparing PE-backed IPOs and non-PE backed IPOs, we find PE investment does not affect BHARs in either time period, which further confirms the speculation behaviour that we proposed from the short-term performance. By examining the performance of PE-backed IPOs, we discover that the larger PE investment results in worse performance in both 12-month and 24-month period. Consistent with the hot PE market, IPOs listed on new boards have better after market performance.

To sum up, this chapter provides the role of PE investors in China based on existing literature and adds Chinese evidence. First of all, in general, PE investors lead to lower underpricing which is consistent with the mature market evidence; secondly, we argue that the lower underpricing may be caused by reasons other than the commonly used certification hypothesis. We propose tests on how PE influences their portfolio firm IPO performance in both short run and long run. Our results do not support the certification hypothesis by showing PE reputation factors have no impact on IPO underpricing. Regarding the minority shareholder positions of most PE investors, during their investment period, they play a limited governance role and they may only help with securing the IPO listing through their network and past experience (Zhang and Li., 2012). Moreover, given the background of the hot IPO market, the heavy intervention capital market, and the weak law and regulation protection environment, PE investment acts only as a new financing channel and the investments are mostly speculative. The purpose of the PE investment is to help a firm go to listing, especially on the new stock boards. By setting up higher offering prices, the PE investors can play their certification role by

signaling the value of the IPO firms and they themselves can exit via IPO and get higher initial returns. The results are not surprising given that China is a fast growing economy and the capital market is still under construction.

Chapter 7 Conclusion

In this Chapter, we first summarize the main findings from this thesis, especially from the three empirical chapters. We then suggest the implication of these findings and illustrate some of the limitations of this study. Lastly, we analyze the current economic and financial difficulties of the Chinese economy and suggest some future research topics on PE investment in China.

7.1 Summary of the main findings

In this thesis, we investigate how the recent hybrid PE investment fits into Chinese economic development, and we unveil the role of PE investment in their portfolio firms. This thesis has three setting points. Firstly, we examine the motivations for Chinese portfolio firms to accept PE investment based on theories from mature market evidence. Secondly, we move on to evaluate the effect of the entry of PE investment on Chinese mainland PE-backed listed firms' in both short and long term. Thirdly, we compare the short-term underpricing and long-term underperformance between PE-backed IPOs and non-PE-backed IPO firms.

In chapter 4, we discuss the motivations for portfolio firms to receive PE investment. Based on the analysis from the literature review, we set our hypothesis based on three standard finance theories, namely financing for investment and growth theory, agency theory and signalling theory. Both Probit and Logit models are used to compare PE portfolio firms to a group of matched firms generated by the Propensity Score Matching method. First of all, we notice that financing for investment and growth theory does not play a significant role in motivating PE investment. This result may be explained by pre-IPO firms having met listing requirements without severe financing difficulties. Secondly, it is shown that firms with better performance and with state background are not

motivated to apply for PE investment rejects signaling themselves as a motivation for PE investment, which seems to consistent with the fact that both type of firms have the advantages of getting listed. Thirdly, firms with a single largest shareholder have higher motivation for receiving PE investment and, especially if the ownership is tightly controlled by the largest shareholder, the motivation becomes significant. This finding is consistent with the fact that PE investors normally become minority shareholders in the portfolio firms. A robustness test focuses on SME listed firms confirms the whole sample findings. Although most of our sample firms received PE investment prior to IPO, there remains a group of post-IPO PE portfolio firms. We examine how the announcement of PE investment affects the stock market prices of the listed firms using an event study. The result implies that there is no significant stock market price change after the announcement of PE investment, showing an insignificant signaling effect. After rejecting some motivation factors from standard literature, this chapter suggests that the motivation of PE investment is for a different purpose in China.

In chapter 5, the PE portfolio firms' accounting performance is examined using cross-section regression models. The evidence shows that the entry of PE investment plays a significant role in affecting portfolio firms' accounting performance in the short-run, although the proportion of PE amount is relatively small compared to firm size. To be more specific, the amount of PE investment has a positive relationship with profitability while the ownership passed on to PE investors has a negative relationship with profitability. The latter can be explained by the short-term profit intention results from the conflicts of interest between PE investors and portfolio firms. To take a closer look at the impact of PE investment, a further step is to divide our sample into sub-groups according to their different stock boards, investor's country of origin, state-ownership information and the probability of syndicated investors. These tests provide an in-depth

understanding on PE impact and differentiate investment behaviour across groups. The findings include: (1) New boards' listed firms are significantly affected by the inflow of PE investment than mainboard listed firms. (2) PE investment from domestic investors has more significant impacts on portfolio firm performance than their non-domestic peers. (3) Firms without state-ownership are more significantly affected by PE investment than firms with state-ownership. (4) Non-syndicated PE investors have greater impact on portfolio firm performance than those syndicated PE investors. The overall results suggest that PE investment does play a significant role in their portfolio firms immediately after PE investment but, at the same time, the conflict of interests leads to a negative effect on performance from PE ownership. Nevertheless, we find PE investment has no impact in the long-run, defined as the two and three years after PE investment. Considering the fact that PE investors normally become minority shareholders in their portfolio firms, we conclude PE investors are short-term profit driven rather than playing a significant role in the long run in their Chinese portfolio firms. The finding from this Chapter helps to reveal the operation of PE investment in China and provides some consistent findings to the previous chapter.

There is no reason to leave out the stock market performance of portfolio firms when studying PE investment in China because the PE market has largely developed after the setting up of two new stock boards. Consequently, we study PE-backed IPO performance in chapter 6. Compared to non-PE-backed IPOs, PE-backed IPOs experience lower IPO underpricing. Although this observation is normally explained by the certification role of PE investors in literature, we attribute this finding to the speculation behaviour of Chinese PE investors after rejecting other possible hypotheses, such as PE reputation factors and PE corporate governance factors. Further evidence is found to support the speculative behaviour hypothesis in Chinese PE investment, including a negatively significant

relationship between the size of PE investment and the underpricing; the underpricing is more severe for new board listed firms than main board listed firms. We then narrow down our sample firms to PE-backed IPOs sample. The observations include: (1) Regardless of PE types, all PE-backed IPOs experience lower underpricing. (2) Chinese domestic PE investors lead to lower underpricing than non-domestic PE investors. By expanding our sample to 12-month and 24-month periods, we find PE investment does not affect long-term performance. These findings further prove the speculative behaviour of PE investment in China. In contrast to the existing literature, we provide further explanation of the investment behaviour of PE investment in China, which is consistent to the nature of this booming PE market and the results from the previous two empirical chapters.

We recapitulate the features of PE investment in China from the observations of PE-backed listed portfolio firms as follows:

- Accompany with the setup of SME and ChiNext board and the restart of IPO, the Chinese PE market underwent tremendous development during the period between 2005 and 2011.
- Until the end of 2011, the majority of PE investment in China had the purpose of generating higher exit returns from the stock market. Unlike PE investment in mature economies, PE investment in China plays a limited role in engaging into corporate governance issues and these investors are short-term profit orientated. This is because: (1) The hot IPO market provides a quick and less risky exit channel for PE investors. PE investor can make investment with a high IPO return after the one-year lock-up period. The IPO exit channel shortens the investment period compared to non-pre-IPO PE investment, which normally takes 6 to 10 years to exit. (2) Most PE investors in China are quite young and so have short operating history. This lack of past

experience has restricted the domestic investors in providing efficient corporate governance instructions to their portfolios firms. (3) China is a country built on tradition and ownership is tightly controlled by ownership of firms for self-protection purposes. Firms with a dominant largest shareholder are more motivated in receiving PE investment due to the minority role of PE investors. Hence, after a PE investment is set-up, there is less chance for PE investors to have real control and, in most cases, even experienced PE investors become minority shareholders. (4) After the establishment of a PE transaction, the entry of PE investors as minority shareholders will be less motived in engaging into management issues. Moreover, the short-term profit orientation of PE investors may create conflict of interests with firm owners, leading to a negative impact on portfolio firm performance. (5) Under the environment of a hot Chinese IPO market, the financing role of PE investors is not significant and PE role is mainly concentrated on smoothing the IPO listing process to ensure a quick exit with high stock market returns. Based on the above mentioned characteristics, we conclude the Chinese PE market is speculative and the majority of investors are speculating on benefits derived from the booming IPO market. This result is determined by the nature of the Chinese market as well as the nature of Chinese IPO market.

The three empirical chapters are tightly integrated. Firstly, the speculation behaviour of PE investors is found in both chapter 5 and chapter 6 from both accounting performance analysis and stock market information. Although we do not conclude chapter 4 using the word speculation, we find that the financing and signaling effects are not the motivation for PE investment, implying the possibility of speculation behaviour. However, results from chapter 4 can be argued by our sample selection bias. Because we focus only on PE-backed listed firms, firms that are really looking for external financing and/or signaling

themselves to PE investors have been missed out. The speculation behaviour is found to be more severe for PE domestic investors and firms listed on two new boards, which are confirmed in both chapter 5 and 6. Secondly, we find no evidence suggesting that PE investment helps with corporate governance or with solving agency conflict, namely, no long-term effect is observed in either empirical chapter 5 and 6. Results from chapter 4 also support this opinion by showing that firms with a single largest shareholder are more motivated to accept PE investors as minority shareholders. Lastly, we find a combined result of the signaling effect of PE investment. In chapter 4, we observe insignificant stock market returns after the PE announcement in post-IPO investment firms. Nevertheless, in chapter 6, domestic investors are observed to have greater impact on portfolio firms than non-domestic investors, which can be explained by their better knowledge and understanding of the Chinese market.

7.2 Implications of the research findings

The overall findings of this research suggest that PE investors in China do not play the same financing and signaling role as they do in developed markets. Because of PE investors' minority shareholder role, they are less motivated in engaging into governance issues and few value-added activities have been added to the portfolio firms. Due to the immature nature of Chinese PE market, investment behaviour is largely speculative and PE investment is largely driven by seeking short-term high profit via IPO exit.

The results drawn from this study have wide implications for PE portfolio firms, PE investors and government policy-makers in China. For PE portfolio firms, rather than considering PE investment as a subsidy for a bank loan, IPO accelerator or even for tax avoidance, they should consider how to make use of PE investment as a tool for upgrading their operation and corporate governance. A concentrated ownership structure exists in

most Chinese firms which should be adjusted for the purpose of giving the rights and obligations to PE investors. After 2011, the IPO market has been cooled down again by the authority and the secondary markets showed worse performance, suggesting a more appropriate way of cooperation between the investor and portfolio firms. Following the experience from the western PE market, the next stage of PE development will mainly focus on PE buyout. As a consequence, how to accept and implicate buyout in China is a question for portfolio firms.

Firstly, for domestic PE investors, it is important to understand the likely future trend of PE investment in China. For example, they may need to switch their business from Pre-IPO to other PE types; to provide funding opportunities for firms seeking financing rather than focusing on IPO firms; to help SMEs with industry integration and industry upgrade. Most important, providing and transforming value added activities in PE portfolio firms are some of biggest challenges. Secondly, for non-domestic PE investors, the understanding of cultural discrepancies can still be an obstacle. For example, dealing with the g*uanxi* relationship with local and central authorities is crucial for foreign PE investors' expansions in China. Thirdly, if both types of PE investors want to act beyond the role of minority shareholder, the ability to solve the problem of the lack of 'bridge' managers is also very important. As indicated by Pukthuanthong and Walkter (2007), there is a shortage of professional PE managers in China. Since the IPO market is experiencing turbulence and Chinese GDP has slowed down, PE investors should have a deeper understanding of the cycle of Chinese economic development and prepare themselves for longer-term PE investment. Last but not least, according to the standard literature, a syndication network is believed to help VCs in providing value-added activities for their portfolio firms, improving the chances of future funds for the portfolio firms and providing stronger signaling effect (Hochberg et al., 2007). However, in our empirical

findings from Chapter 5, PE investors do not fulfil these advantages in their portfolio firms. Thereafter, how to move from individual investor to syndicated investors and how to cooperate effectively with each other can also be a new task for PE investors.

The implications for government policy and regulation are as follows: (1) Administration reform. Both central and local government would do well to think about integration of PE investment with the current capital market and financial system reform. For example, authority can provide more favorable regulation to encourage the entry of USD PE funds and to the setting up of hybrid foreign/Chinese USD & RMB private equity funds. (2) Legal reform. For example, all acquisitions in China by foreign investors are subject to and encouraged by the *Catalogue for the Guidance of Foreign Investment Industries*. However, in reality, the foreign ownership structure has been restricted from industries such as telecommunication. Even in a joint venture company where foreign ownership is permitted to perform as majority shareholder, the majority shareholder cannot obtain complete control when their partner has a State background (Eich and Li., 2006). Further, although the *Enterprise Bankruptcy Law* of China has been in effect since June 2007, domestic firm owners are not familiar with this protection tool. Therefore, the government should strengthen investors' and owners' understanding of legal application with the help of experienced PE investors. (3) Investor reform. The development of Chinese PE market provides an opportunity for domestic investors to make PE investment overseas. The government has an obligation to set up laws and regulations to help domestic investors and smooth the way for 'going out'.

Based on the empirical findings, we make the following prediction on the future development trend of PE industry in China:

(1) Domestic IPO exit is no longer the best PE channel given the poor performance of the

domestic IPO market, the unpredictable IPO freeze and the strengthened audit system for IPO issuing. Due to the current market saturation, firms (especially SOEs and large high-tech firms) will choose to exit via IPO in overseas market rather than domestic stock markets. Hence, PE investors with overseas background and/or non-domestic PE investors will become more welcome. (2) The path of PE development in mature market economics has shown that a buyout market will eventually replace the PE-backed IPO market. Based on the current corporate governance upgrade in China, PE buyout investment will become the new trend in China. Therefore, there is room to expand the current business modes for PE investors, especially in coping with the concentrated ownership structure in portfolio firms and to provide value-added activities for PE portfolio firms. One concern would be whether PE investors can gain trust from their portfolio SOEs, especially in helping with corporate governance adjusted and resource reallocation. (3) Instead of targeting small and private firms, PE investors will start to work with SOEs and help with the current SOE upgrade. The selection of PE investors for large SOEs is mainly from large PE firms and PE investors with overseas background. For the latter, these PE investors can help SOEs with overseas business expansion, improving international collaboration and providing overseas listing opportunities.

7.3 Limitations of this thesis

There are a number of limitations in this study that should be addressed. First of all, the limitation of sample firms used in this thesis. The findings in this thesis are limited to the public listed firms and a large sample of PE-backed non-listed firms is left out. We believe that the focus on listed firms causes selection-bias problem. For example, good firms that are willing to be listed may not be bothered by the financing difficulty issues, confirmed by Chapter 4. Hence, our sample selection has left out a group of non-listed firms that cannot meet banking loan and listed requirements but are really looking for alternative

financing channels such as PE. It would be interesting to focus on non-listed firms in future studies. Secondly, although our sample includes by far the largest number of PE-backed sample firms (a sample of 364 PE-backed firms), we use a cross-section rather than panel data due to the data limitation when PE took place before IPO. As a result, we are unable to employ advanced econometric methods, such as, instrument variable and GMM method, to avoid some potential selection and endogeneity problems. However, these data and methodology problems are difficult to avoid at this stage. We believe that, in the further development of a Chinese PE market, a more well-established dataset will be set up and will provide more comprehensive and reliable information.

7.4 The future of the Chinese PE market and future work

China is undergoing sweeping economic reforms, aiming to rebalance the economy. China's double-digit annual growth-rate is over. According to the IMF report, the forecast inflation-adjusted GDP will continue to slow down from a projected 7.4% in 2014[42], shown in Figure 7.1. Assuming no change in the exchange rate and a continuation of current policy plans, Chia's inflation-adjusted GDP will continue to slow over the rest of decade. The slowing growth rate means policymakers have enough room to maintain growth rate in a comfortable range when delivering the reform. The current Chinese reform faces multiple challenges, including government reform, household registration reform, land reform, capital market and financial system reform. The capital market and financial system reform includes two most urgent factors which are the controlling of excessive local debt[43] and unregulated shadow banking[44]. These problems require

[42] The GDP growth rate is 7.4% in China, according to the National Bureau of Statistics.

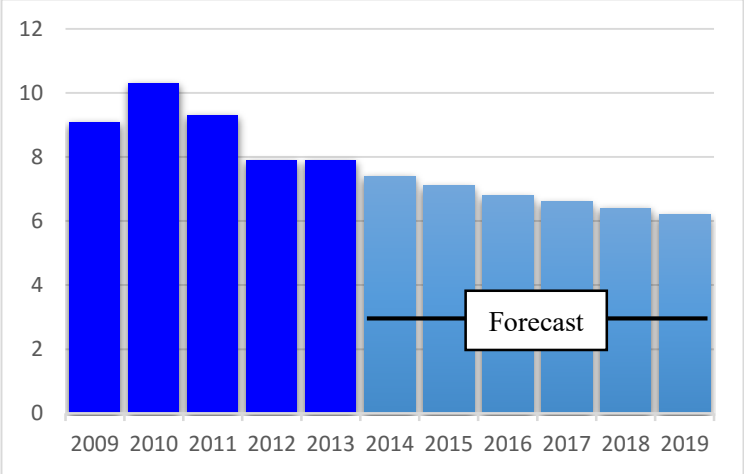
[43] At the end of 2013, it is revealed by China's national auditor that the liabilities of provincial governments had grown to 10.9 trillion Yuan (**$**1.8 trillion), or 17.9 trillion Yuan if all of the debt guarantees were added. The figure was equivalent to around one thirds of the country's GDP. These debts had grown in an enormous speed to become a national burden as well as an international concern regarding China's future growth.

[44] Shadow banking refers to financial activities that occur off-balance sheet and are regulated. In contract to the conventional banks, the shadow banking system includes trusts, leasing companies, credit-guarantee outfits and money-market funds. By promising returns as high as 10%, they raise money from business units and high net wealth individuals. They charge an even higher interest and lend to firms which are unable to borrow from banks, for example in industries where regulators realize the overinvestment and have commanded banks to restrain loans. The biggest

effective solutions to maintain the stability of China's financial system. However, the country's increasing domestic demand, favorable demographics, and its critical role as a global manufacturer and exporter will continue to provide a wide range of opportunities to investors with solid investment assets.

concern is the borrower are often from the so called 'frothy industries', such as property, steel and raw materials. The estimated size of shadow banking in China account for about 50-60 per cent of China's GDP or around 25-30 per cent of banking assets, although still lower than the global average of 117% and 170% for the US.

Figure 7.1 The IMF forecasts on China's inflation-adjusted GDP from 2014-2019



Source: *IMF report*

Table 7.1 Four scenarios of the future of PE industry

	Constant investor base	Turnover in investor base
Fair returns	Recovery	Backed to the future
Disappointing returns	A broken industry	The Limited Partners' Desertion

Lerner (2011), the future of Private Equity

In his work 'The future of Private Equity', Lerner (2011) has proposed a two-by-two matrix in predicting the four possible scenarios of the PE market, shown in Table 7.1.

The horizontal axis indicates the role of investors: who still stay in the PE industry and who have made shifts to leave the industry. The vertical axis represents the returns of PE investment between fair returns and the investors who are going to get returns under their expectation. The first scenario 'recovery' shows increasing familiarity with the way PE process has make this type of investment even more attractive than it was, , leading to fair returns. According to the general pattern, investment made during the booming market (in terms of both fundraising and investment) appears to perform worse[45]. Hence, to compensate investments made at the market peak, the level of PE is likely to rebound in the following years. In the second scenario 'backed to the future', due to the different returns for PE investors, the largest and smallest investors are more likely to exit[46]. Thus, the pool will be dominated by mid-sized investors and they are going to enjoy a less competitive and better performing market. In the scenario 'the limited partners', LP may be forced to exit the market given the disappointing returns and GPs can only raise smaller funds. The last scenario 'a broken industry' suggests a very unhappy ending that the inefficient industry might continue for a decade or even longer. The author's opinion tends to be located in between the first and second scenarios.

This prediction is for the general PE market but is mostly based on the mature economies. For China, we can be very optimistic about the future of the PE market: China will continue to attract significant funds from global investors as they want to participate in China's growth story; the young Chinese market has left a lot of room for the exploration

[45] For example, if firms use excessive leverage and overpay transactions during market peaks, it is expected that such firms with high leverage activities are going to experience downturns in the following years.
[46] Small funds are likely to exit because it is too costly for them to invest. For large PE investors, there remain a few choices given the size of capital they require for making investment.

of other PE types and PE exit routes; the access to the SOE sectors will attract a large amount of overseas PE investors. The Chinese PE market has exhibited some new features since 2011 (our sample period ends at 2011), which are listed as follows:

- In the second half of 2011, PE fund raising became more difficult under the environment of inflationary pressures and the continued tightening of monetary policy. In 2013, IPO issuing was frozen for the whole year. The cooling down IPO market has forced PE investors to re-think their investment strategy and the mechanism of investment. PE institutions began to focus on professional investment and management after setting up the deals. A latest trend is M&A has substituted IPOs as the popular exit channel.
- On 14th December 2013, the OTC market[47] was set up which is regarded as a further move to expand access to credit market for small and medium-sized enterprises (SMEs). This OTC stock board will be targeted by PE investors as the new exit channel in China.
- After a 15-month halt, China restarted its new listing on the stock market in 2014. In this round of investment, PE investors not only have the stock market as the exit channel but also have the opportunity to work with state firms. The new proposed plan for SOE reform includes development of a mixed ownership economy, to introduce the entry of equity participation in helping with the integration, IPO listing, international mergers and acquisitions. This new policy has stimulated the enthusiasm of PE investors, some of them have established a special working group in coping with the opportunity to work with SOEs.
- Following Lerner's (2011) prediction, we expect the small and speculative PE

[47] According to this new plan, companies with 200 or fewer shareholders that want to be quoted on the national equities exchange and quotation system will no longer face approval requirements prior to their quoting. Different from the existing stock markets in Shanghai and Shenzhen, the OTC exchange was designed specifically for non-public firms to seek capital and investors to trade equities over the counter. These non-public firms are too small to list and too risky for regular bank financing. Essentially, this new liberalizing reform of China's OTC market may give small companies something to look forward to in the coming years.

investors are more likely to exit due to their weak competitive advantages in the current PE market. The pool will be left with large PE investors and investors who are working hard on adding value to their portfolio firms in the long run. Rather than using IPO as an exit channel, PE investors are looking to explore other exit channels, one of which is exit via M&A. The steadily expanding PE market provides large potential profit opportunities and will continue to attract both domestic and international PE investors.

In sum, compared to the PE market which was largely IPO driven and where investors become speculative, the Chinese PE market has been further developed in the past few years. In the current wave, PE investors have become more mature and they tend to focus on operation adjustment, helping with quality management by providing more value added activities. Based on the above analysis and predictions, we list several areas for future research topics in the following. First of all, it is worth examining how PE investment has been changed and development in terms of operating performance and corporate governance impact after 2011. It can also be fascinating to see whether Chinese PE investment and PE-backed firm performance outperform other BRIC countries such as India and Russia, to see whether speculation behaviour is a common characteristic in these fast developing economies. Based on the geographical dimension, the comparison can be carried out for variables such as exit channel, early stage versus late stage investment, different industry sectors and investors' country of origin. These results can offer more useful information to international investors and investors who seek to invest globally.

As the worst-performing stock market in Asia, the domestic IPO market as exit channel is becoming less attractive. Many large domestic firms have moved to listed/multi-listed

overseas. It would be an interesting topic to examine the motivation for overseas listing and aftermarket performance of these firms. The comparison can also be carried out between PE-backed overseas listed Chinese firms and PE-backed/non PE-backed listed firms from the same board. Moreover, how the overseas stock market setting helps to stimulate IPO and stock market performance can be further explored. For example, if the ChiNext board is regarded as NASDAQ in New York Stock Exchange and AIM in London Stock Exchange, how can listing rules and regulations be released to attract more entry of investors? Such information would benefit PE investors and provide insights for policy makers on how to build up the Chinese stock markets.

As discussed in the previous section, PE investment will experience further expansion in the Chinese market. According to the general development stage of PE investment, buyout will play the leading role in the next stage of PE investment. In its early stage, buyout represents a back-door listing tool for big firms and speculation firms. Recently, Chinese buyout firms have started to focus on the real value of their portfolio firms. The largest challenge for PE investors is how to become the majority shareholder and to fulfill investor duties. Moreover, since getting buyout information is difficult, it is worth carrying out case studies to see how corporate governance is gradually improved in the target firm.

Very few studies have focused on Chinese PE fund performance because the lack of disclosed information. With the development of the market, funding information should become more accessible. This is because a more formalized database will be set up and PE investors are keen to reveal better performance to attract LPs. To test fund performance, we can use the Public Market Equivalent (PME) to compare a PE investment to a public market index set up by Long and Nickles (1996) and improved by

Kaplan and Schoar (2005). It is also interesting to compare domestic investors to international investors, for example, do they spend more or less time processing a deal than their overseas competitors? Will the late stage PE investment help to stimulate innovation in both products and services?

Appendix

Chapter 2

Appendix 2.1 PE type summary

Early stage	Seed	Financing that allows a business concept to be developed
	Start-up	Financing provided to companies for use in product development and initial marketing
Expansion stage	Growth capital	Financing provided for the growth and expansion of an operating company which is trading profitably
	Bridge loan	Financing made available to a company in the period of transition from being privately owned to being publicly quoted
	Franchise funding	Financing provided to a company with franchise in a particular area for the further development
Mezzanine stage	Pre-IPO	Financing provided to help a company go public.
	PIPE	Financing provided to entrepreneur-driven listed companies for rapid growth
	PE-backed IPO	Financing involved into companies' go listing process.
Buyouts stage	Buy-out	Funds provided to enable current operating management and investors to acquire an existing product line or business
	Management buyout	Funds provided by internal manager or group of managers to buyout a company;
	Secondary buyouts	Purchase of a company from another private equity investment organisation.
Late stage	Turnaround	Financing provided to re-establish a business which has encountered performance difficulties

Appendix 2.2 Academic and non-academic PE sources

Academic research on the subject of PE investment has been increasingly specialized in recent years. Numerous articles on the subject of PE have been found in top finance journals, such as *the Journal of Finance*, *the Journal of Financial Economics, the Review of Financial Studies*, *Business Venturing* and *the Journal of Corporate Finance*. Moreover, there are two academic journals specializing in PE topics: *Venture Capital: An International Journal of Entrepreneurial Finance* and the *Journal of Private Equity*, established in 1999 and 1997 respectively.

In addition to academic journals, regional and/or national PE research associations have been set up around the world such as the National Venture Capital Association (NVCA) in the US, The European Venture Capital Association (EVCA), the British Venture Capital Association (BVCA), the Emerging Markets Private Equity Association (EMPEA) and the China Venture Capital Association (CVCA). These associations are intended to facilitate dialogue and co-operation between the public sector and private investment community, to promote industry by holding international and/or domestic seminars and conferences, to act as a platform for limited partners, professional advisers and service providers to meet up, to unlock potential opportunities and to provide capital and expertise for growing businesses. Most importantly, these associations collect information from their general partners and provide reliable PE performance data for investors and researchers.

Because PE investment and performance information is not fully provided by government or the Statistics Bureau, private research institutions and publishers have started to publish industry data—most of the data are provided voluntarily by PE investors and portfolio firms. For instance, global PE information can be found in Preqin, S&P Capital IQ, Thomson Venture Economics and Securities Data Company (SDC) database and

Venture One Database. The Centre for Management Buy-out Research (CMBOR) provides UK and Europe PE transaction information and the Asian Venture Capital Journal (AVCJ) database provides Asian PE information. Apart from the above information channels for PE, internet websites specializing in the PE market have also become an important source in the last few years. The largest ones include the following: *venturecapitalreporter.com*, *vcgates.com, ThisIsPEI.com* and *penews.com*. The *chinaventure.cn* and *pedaily.cn* focus on Chinese PE information.

Appendix 2.3 A summary of PE investor types in China

Government-backed PE firms	National Council for Social Security Fund SDIC Innovation (Beijing) Investment Fund Management Co., Ltd. Hefei Hi-Tech Venture Capital Co., Ltd. Shenzhen Capital Group Co., Ltd. Shandong High-Tech Investment Corp. Guangdong Technology Venture Capital Co. Ltd. Shenzhen Capital Group Co., Ltd.,
Securities-backed PE firms	Goldstone Investment under CITIC Securities Haitong Capital under Haitong Securities Guosen H&S investment company under GuoSen Securities
Banks-backed PE firms	BOC (Bank of China International) CCB (China Construction Bank) International ICBC (Industrial and Commercial Bank of China) International.
Other domestic PE firms	University–backed PE firms: TusPark Capital Co., Ltd. Shenzhen Tsinghua Leaguer Venture Capital Co., Ltd. Zhejiang University Venture Capital Co., Ltd. Corporation-backed PE firms: Hony Capital under Legend Capital Ltd. Xiamen Torch Venture Capital Co., Ltd. under Xiamen Torch Group Ltd. Fosun Venture Capital under Shanghai Fosun Group Crown Prince Party-backed PE firms: New Horizon Boyu Capital Advisory CO., Ltd
Overseas PE firms	Blackstone, KKR, Carlyle, Bain Capital, Goldman Sachs PIA

Chapter 4

Appendix 4.1 The Propensity Score Matching method (PSM)

The specific propensity score matching implementation we use is based on Abadie and Imben's (2002) application of the idea from Rosebaum and Rubin (1983). PSM refers to pairing of treatment and control units with similar values on the propensity score. The use of the method helps to reduce a multidimensional matching problem to a one-dimensional problem.

A propensity score is the probability of a unit being assigned to a specific treatment given a set of covariates. Propensity scores are employed to reduce selection bias by equating groups based on these covariates. Assuming a binary action (or treatment) S, and an arbitrary set X of measured covariates. Normally, propensity score $p(\mathbf{x})$ should meet the following conditions:

$$(Y_0, Y_1) \perp D \,\|\, X \qquad (4.7)$$

$$0 < \Pr(D = 1 \,\|\, X) < 1 \qquad (4.8)$$

Where X is a vector of covariates. Equation (3.7) says that, condition on X, the outcomes for both treatment and control groups should follow the same distribution. Condition (3.8) says that at each level of X, the probability of observing both the control and the treated groups is positive. P(X) is the propensity score, where

$$p(X) = \Pr(D = 1 \,\|\, x) \qquad (4.9)$$

P(X) is the probability that action D = 1 given that X = x. Rosenbaum and Rubin show that if the conditions in equations 3.7 and 3.8 are satisfied, then

$$(Y_0, Y_1) \perp D \,\|\, P(X) \qquad (4.10)$$

And

$$0 < \Pr(D = 1 \| P(X)) < 1 \qquad (4.11)$$

There are two commonly used methods for selecting control groups: the nearest-neighbor method and caliper matching. The nearest-neighbor method selects the m comparison units whose propensity scores are closest to the treated unit in question. Caliper matching uses all the comparison units within a predefined propensity score radius (or 'caliper'). We use the nearest neighbor propensity score matching method to ensure that those matched samples are as comparable as possible. In our specifications, to control for the selection bias of PE-backed firms and non-PE-backed peers, we obtain a propensity score by using an alliance based on target firm characteristics. We calculate the absolute distance in propensity score between each PE portfolio firm and firm generated based on size. From the results of possible matching peers, we require the maximum difference between the matching firm and the portfolio firm does not exceed 5% in absolute value. After the excluded non-PE-backed firms without available accounting and corporate governance information from CSMAR database, a sample of 318 non-PE peers from 2000-2011 is generated as our matching firms.

Appendix 4.2 Variable definitions

Variables	Definitions
Age	Age is the age of firm at the time of PE investment.
Sales	Sales growth rate is the rate of change in sales.
Ave _ ROA	Agree ROA is the average return on assets the past three years.
State _ dum	State dummy variable indicates whether the firm is backed by state ownership.
HI	The Herfindahl Index is the squared sum of share percentages held by top4 shareholders.
L arg *est*	The largest shareholder represents the ratio of shares controlled by the largest shareholder.

Chapter 5

Appendix 5.1 Variable definitions

Variables	Definitions
ROA	ROA is calculated by net income/total assets to measure the profitability of the firm.
Size	Firm size is measured by the natural logarithm of a firm's total assets.
Leverage	Leverage ratio, is measured by total debt over total assets.
Sales	Sales growth rate, is calculated by $(Sales(t+1) - Sales(t))$ divided by $Sales(t)$ where t is the year PE investment took place.
*PE*amount	*PE* amount is measured using the cumulated total amount of PE investment that have been received before IPO to divide firm's total assets.
*PE*deal	PE deal is the cumulated total shares controlled by P investors before IPO.
Round _ *dum*	PE round dummy variable takes 1 if this is the first PE investment to the portfolio firm and 0 otherwise.
IPO _ dum	IPO dummy variable equals 1 if PE investment happened before IPO and 0 if PE investment happened after IPO.

Chapter 6

Appendix 6.1. IPO underwriter ranking from 2008-2011

In western studies, underwriter reputation ranking normally follows Carter and Manaster's ranking for 1980-1984 (1990) and Carter, Dark, and Singh's ranking for 1985-1991 (1998) in the US market. However, a similar Carter-Manaster underwriting does not exist in China because: a) the tombstone announcement of IPOs from the US is different from Chinese IPO announcement; b) the stock market history in China is not long enough compared to the US. Hence, we collect the annual report of Securities' performance statistics realized by the Association of China (SAC). This report announces the top 20 underwriters of the year based on the total amount of underwriting and the total number of IPOs undertaken. From the SAC website, we found the reports available from 2007-2011. However, in the 2007 report, the ranking was a combination of stock and bond performance rather than stock performance only. Hence, we eliminate the 2007 report and use the reports from 2008-2011.

To calculate the underwriter reputation, we use two kinds of information: Securities' underwriting amount from 2008-2011 and Securities' number of times as leading underwriter from 2008-2011. We then summarize the accumulated underwriting amount and the total number of times as underwriter for each firm. The underwriter ranking score for each firm is defined as:

Underwriter ranking score=

50%*(the total underwriting amount of funds for firm i/the total amount of underwriting funds)+

50%*(the number of times as leading underwriter for firm i/the total number of underwriting)

We rank the underwriter according to the score and list the top 20 firms in the table below. In this table, we define the top 20 firms with high underwriter reputation as it was defined

in the original reports. As a result, if the underwriter firm comes from the top 20 list, the underwriter variable is defined as one and zero otherwise.

Appendix 6.2 IPO underwriter ranking from 2008-2011

Reputation ranking	Underwriter
1	CITIC Securities
2	CICC (China International Capital Corp)
3	Ping An Securities
4	Guotai Junan Securities
5	Haitong Securities
6	Guosen Securities
7	Galaxy Securities
8	Southwest securities
9	China Merchants Securities
10	Huatai Securities
11	BOC (Bank of China) International Holdings Limited
12	China Securities Co., Ltd (CSC)
13	GF Securities
14	Essence Securities
15	Industrial securities
16	Everbright Securities
17	UBS investment bank
18	Tiantong Securities
19	Great Wall Securities
20	Orient securities

Appendix 6.3 Variable definitions

Variables	Definitions
IR	IR is the initial IPO return measured using the formula $IR_{i1}=\frac{P_{i1}-P_{i0}}{P_{i0}}$, where IR_{i1} is the return for stock i on its first trading day, P_{i1} is the closing price of stock i on its first trading day and P_{i0} is the offering price of stock i.
MAAR	*MAAR* is the market-adjusted abnormal return using the Shanghai Stock Exchange Composite A- share Index as a benchmark to obtain the adjusted abnormal stock returns for stock i, i.e. $MAAR_{i1}=IR_{i1}-R_{m1}$, where R_{m1} is the benchmark stock market returns computed based on the Shanghai Stock Exchange Composite A-share Index on the first trading day of stock i.
PE	Dummy variable *PE* which takes the value of one if the IPO is PE-backed, otherwise it is zero.
PEfund	*PE* fund is measured using the cumulated total amount of PE investment that have been received before IPO to divide firm's total assets.
PEdeal	PE deal is the cumulated total shares controlled by P investors before IPO.
PEreputation	PE reputation equals 1 if the PE investor is from the high reputation group and 0 otherwise.
Newboard	Stock board dummy, which equals to 1 if the IPO is listed on new boards and equals to 0 if listed on main boards.
Size	Firm size, which is measured by the natural logarithm of total assets of the firm in the year before IPO.
Age	Firm age refers to firm age at the time of IPO, which is measured by using the IPO year minus the firm's establishment year.
Leverage	Leverage which is the ratio of total debt to total equity of the firm in the year before IPO.
ROA	Return on Assets is measured as the ratio of net income to total assets of the firm in the year before IPO.
Underwriter	Underwriter variable which takes the value of one if the underwriter involved in the IPO is among the group of highly ranked underwriters in China shown in Appendix 1
Proceeds	IPO proceeds which is measured by the natural logarithm of IPO proceeds.
PEratio	The price to earnings ratio, which is an element to be considered in pricing IPO.
Lottery	The odds of winning the lottery.
Delay	The difference between the IPO offering day and its first trading day.
Volatility	The overall stock market volatility, which is measured by standard deviation of stock market returns in the past 90 days before IPO.
State	State ownership, which is measured by the percentage of shares held by the State.
Sales	Sales growth is measured by the sales growth rate at the time of IPOs
TobinQ	The Tobin's Q rate at the time of IPOs
SEO	Seasonal Equity Offerings, which is a dummy variable taking the value of one if the firm issued SEOs within two years after the IPO and zero otherwise.

Appendix 6.4 Top 30 Private Equity Investment Institutions in China

This table summarizes the top 30 PE firm listed on *China Venture Capital and Private Equity Annual Ranking* from 2007 to 2011.

Top 30 PE investors	Country of origin
Baring Private Equity Asia	HongKong
CCBI (China Construction Bank Corporation Investment)	China
CDH Investments	China
China Merchants Technology Group Co.,Ltd	China
China Science & Merchants Capital Management Co, Ltd.	China
CITIC Private Equity Funds Management Co.,Ltd	China
Fortune Venture Capital Co., Ltd.	China
Fosun Capital Group	China
GoldStone Investment Co., Ltd.	China
Haitong-Fortis Private Equity Fund Managemetn Co., Ltd	China
Hony Capital (Beijing) Co., Ltd.	China
HOPU Investment Management Co. Ltd.	China
IDG Capital Partners	China
Jiangsu High-Tech Investment Group (Govtor capital)	China
Jiuding Capital	China
Kohlberg Kravis, Roberts & Co.	US
Kunwu Jiuding Capital Co., Ltd.	China
Legend Capital	China
Morgan Stanley Private Equity Asia	HongKong
New Horizon Capital	China
NewMargin Ventures	China
Ping An Caizhi Investment Management Co.,	China
Qiming Weichuang Venture Capital Management (Shanghai) Co., Ltd	China
SAIF Partners	HongKong
Sequoia Capital China	China
Shenzhen Capital Group Co.,Ltd.	China
Shenzhen Co-win Venture Capital Investments Limited	China
The Carlyle Group LLC	US
The Goldman Sachs Group Principal investment area	US
Warburg Pincus LLC.	US

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